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Basic Day Colleges Curriculum Guide and Course Descriptions

1990-1991



Northeastern University

**Basic Day Colleges
Curriculum Guide and
Course Descriptions**

1990–1991

In 1837, Mary Harris Thompson crossed a threshold that transformed the medical profession. By becoming the nation's first female surgeon, she unlocked a door for all women, inspiring those who believed the future was closed to them. Since then thousands have proceeded through that gateway.

To travel across a threshold, one must venture uncharted horizons. By zealously pursuing their goals, pioneers like Amelia Earhart, Albert Einstein, Florence Nightingale, and Jesse Owens revealed boundless opportunities for future generations. Their accomplishments have broadened our vistas.

As the twenty-first century approaches, advances in fields such as technology, business, and education increasingly will require people who embrace the unknown. As you choose your field you embark on a lifelong process of learning. By exploring new concepts and divergent viewpoints in your undergraduate studies, you prepare your personal and professional contributions. You now begin opening doorways for your own future as well as for all those who come after you.

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Appendix

Curriculum Guide

College of Arts and Sciences

The College of Arts and Sciences offers degree programs in twenty-two majors. In most majors, two degrees are offered: the bachelor of arts and the bachelor of science. Requirements specified by the department offering each major are listed on the following pages. In addition to the requirements specified by the department, the college has established certain minimum graduation requirements for students.

Quantitative. Candidates for either the bachelor of arts or bachelor of science degree must successfully complete 176 QH credits, of which 144 QH must be arts and sciences courses. In addition, only 4 QH of physical education and no ROTC credits may be used to meet this requirement.

Residency. Candidates must complete either 75 percent of the degree credit (132 QH) or the last three full quarters (a minimum of 12 four-credit courses) in the Northeastern University Basic Day Colleges.

Qualitative. Candidates must achieve a minimum cumulative average of 2.0 (grade of C).

The Core Curriculum

The College of Arts and Sciences core curriculum is required of all students.

The core curriculum is a set of requirements intended to provide students with the opportunity to gain the broad base of knowledge traditionally associated with a liberal arts education. The core gives students the opportunity to develop proficiency in basic skills; to be exposed to methods of analysis in the various subjects and disciplines in the arts and humanities, the social sciences, and the natural sciences and mathematics; and to become acquainted with ideas in Western culture, differing views in non-Western cultures, and major issues and problems facing contemporary society.

The core curriculum consists of six categories.

Category I Basic Skills:

- Freshman English (two or three courses)
- College mathematics
- Modern language through Intermediate 2 level (required of all BA candidates)

Note: For placement information on freshman English, college mathematics, or modern languages, students should consult the Office of the Dean, 400 Meserve Hall, or the appropriate department. Placement criteria are published in *The College of Arts and Sciences Guidebook*.

Students who plan to use Russian or Italian language study to satisfy the foreign language requirement should begin their program early because the college is not always able to offer these courses on a regular basis.

Category II Methods of Inquiry

Category III The Western Cultural Heritage

Category IV Alternative Cultures and Societies

Category V Theoretical Perspectives and Changes

Category VI Current Issues in Perspective

Note: Descriptions for all College of Arts and Sciences courses begin on page 55. Courses approved for the College's core curriculum have Roman numerals in parentheses at the end of the descriptions. Roman numerals indicate the appropriate core curriculum categories for each core course. Students are required to complete courses in each category of the core, depending upon the major and degree pursued. *The College of Arts and Sciences Guidebook*, available in the Office of the Dean, 400 Meserve Hall, provides a thorough description of the courses required in each category, as well as a list of courses that may be used to fulfill each requirement.

Middler Year Writing Requirement

The middler year writing requirement (MYWR) is a University requirement. The College of Arts and Sciences strongly recommends intermediate writing (ENG 1350) to complete the MYWR. Students may, however, also satisfy the requirement by completing a four-credit writing course from the approved MYWR list with a grade of C or better or, with special permission through the petition process, a one-credit writing workshop (ENG 1340). Students not participating in the cooperative education program complete the MYWR in their junior year.

College Honors Program

The College of Arts and Sciences Honors Program runs honors sections of some required or elective courses, as well as some interdisciplinary honors seminars and minicourses. Many of these courses are equivalent to standard courses in the college for satisfaction of degree requirements. The course number is designed to make this apparent. For example, an honors section of ECN 1115 will be numbered ECN 1715; PHL 1100 is PHL 1700. A full list of the offerings can be found in each quarter's booklet of course offerings, listed under the departments that offer the courses, and identified with a 1700 number.

For more information on honors courses, how to qualify to take courses, and other aspects of the program, contact the Honors Program Office at 617-437-2333 or drop by 213 Lake Hall.

Students should refer to *The College of Arts and Sciences Guidebook*, and any publications distributed by major departments for more specific information about the curriculum.

African-American Studies

Bachelor of Arts

Bachelor of Science

A major in African-American studies offers background for a range of professions calling for understanding of intergroup relations and the minority experience. Students may go on to graduate study in such areas as social work, sociology, education, law, business, history, or the humanities.

Students majoring in African-American studies may earn either the bachelor of arts (BA) or bachelor of science (BS) degree. All majors are required to take the following set of courses.

AFR 1127 African-American Literature

AFR 1131 African-American History 1

AFR 1161 Economic Issues in Minority Communities

AFR 1171 Survey of Contemporary Black

Political Movements

AFR 1240 Contemporary Issues in Black Society

AFR 1248 Race Relations in America

AFR 1280 Black Psychological Identity

AFR 1300 Directed Study

AFR 1350 Research Seminar

In addition, complete the arts and sciences core curriculum (see page 2).

Faculty advisers work with students to help them select one or more "concentration clusters" (as described below) in African-American studies.

Minor in African-American Studies

A minor in African-American studies is designed to meet the needs of students who major in other areas but have special interest in African-American studies. To qualify for a minor, a student must earn 28 QH credits in the field, 12 of which must be from the set of courses required for majors. The remaining credits will be a concentration cluster arranged in consultation with a student's faculty adviser.

A concentration cluster is a set of four courses that focuses on an aspect of African-American studies. A cluster might focus on sociology-psychology, history, humanities, human service, research, or other areas related to the student's educational or career needs. Concentration clusters are arranged in consultations between the student and a faculty adviser.

Art and Architecture

Bachelor of Arts

Bachelor of Science

Major in art. ART 1100, History of Art to 1400, and ART 1101, History of Art since 1400; ART 1124, Basic Drawing; ART 1130, Visual Studies Foundation 1; ART 1131, Visual Studies Foundation 2; and twelve art electives.

In addition, complete the arts and sciences core curriculum (see page 2).

Architecture concentration. Leading to a BS degree that is not a professional degree in architecture. Same requirements as for the art major, except for the twelve art electives that are replaced by four

architectural history courses (ART 1111, Introduction to Architecture; ART 1203, Medieval Architecture; or ART 1204, Renaissance Architecture; ART 1225, Modern Architecture 1 and ART 1228, Modern Architecture 2); five architectural studio courses (Architectural Design 1 to 4 and Architectural Thesis 1); four building technology and management courses; and four math/science courses (MTH 1123, Calculus 1; MTH 1124, Calculus 2; PHY 1221, Physics for Engineering Students 1; PHY 1222, Physics for Engineering Students 2. To fulfill all requirements for the architecture concentration, students must begin required courses in the first year.

In addition, complete the arts and sciences core curriculum (see page 2).

Visual and media design concentration. Same requirements as for the art major, except for the twelve art electives that are replaced by: ART 1132, Graphic Design 1; ART 1134, Typography; ART 1139, Print Production; ART 1160, Introduction to Photography; ART 1180, Video Basics; ART 1190, Introduction to Computer Graphics; ART 1213, Modern Painting; ART 1240, History of Graphic Design; ART 1241, Advertising Design; ART 1243, Graphic Design 2; ART 1250, Color Theory and Practice; ART 1254, Intermediate Drawing; ART 1263, Introduction to Color Photography; ART 1280, Media Graphics; ART 1290, Electronic Publishing Design; ART 1291, Intermediate Computer Graphics Workshop; ART 1330, Advanced Visual Communication; SPC 1300, Introduction to Communication Theory; MGT 1115, Introduction to Business; and MKT 1435, Introduction to Marketing.

In addition, complete the arts and sciences core curriculum (see page 2).

Minor in Art

History of architecture. ART 1200, Ancient Architecture; ART 1203, Medieval Architecture; ART 1204, Renaissance Architecture; ART 1223, American Architecture; ART 1225, Modern Architecture 1; and ART 1228, Modern Architecture 2.

Studio art. ART 1124, Basic Drawing; ART 1127, Basic Painting; ART 1130, Visual Studies Foundation 1; ART 1132, Graphic Design 1; ART 1138, Introduction to Printmaking; and ART 1243, Graphic Design 2 or ART 1254, Intermediate Drawing.

Graphic design. ART 1130, Visual Studies Foundation 1; ART 1131, Visual Studies Foundation 2; ART 1132, Graphic Design 1; ART 1134, Typography; ART 1241, Advertising Design or ART 1243, Graphic Design 2; and ART 1250, Color Theory and Practice.

Photography. ART 1160, Introduction to Photography; ART 1261, Intermediate Black and White Photography; ART 1230, History of Photography; ART 1233, Contemporary Directions in Photography; ART 1263, Introduction to Color Photography; and ART 1363, Advanced Photography Seminar.

General minor. Selection of any six courses from the departmental curriculum.

Biology

Bachelor of Arts

BIO 1103, Principles of Biology 1; BIO 1104, Principles of Biology 2; BIO 1105, Principles of Biology 3; BIO 1211, Environmental and Population Biology; BIO 1260, Genetics and Developmental Biology; BIO 1261, Cell Physiology and Biochemistry; and four advanced biology electives approved by department Advisory Committee.

MTH 1106, MTH 1107, *or* Calculus (one year); PHY 1201, PHY 1202, Physics for the Life Sciences 1 and 2, PHY 1501, PHY 1502, Physics Lab for the Life Sciences 1 and 2; *or* PHY 1231, Physics for Science Majors 1; and PHY 1232, Physics for Science Majors 2, *or* PHY 1233, Physics for Science Majors 3; PHY 1531, PHY 1533, *or* PHY 1532, Physics Lab for Science Majors 1 and 2 *or* 3; CHM 1111, General Chemistry; CHM 1122, General Chemistry 2; CHM 1221, Analytical Chemistry; and CHM 1264, CHM 1265, Organic Chemistry 1 and 2.

In addition, complete the arts and sciences core curriculum (see page 2).

Bachelor of Science

BIO 1103, Principles of Biology 1; BIO 1104, Principles of Biology 2; BIO 1105, Principles of Biology 3; BIO 1211, Environmental and Population Biology; BIO 1260, Genetics and Developmental Biology; BIO 1261, Cell Physiology and Biochemistry; BIO 1490, Senior Seminar; four advanced biology electives approved by department Advisory Committee.

Calculus (one year); PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors 1, 2, and 3; PHY 1531, PHY 1532, Physics Lab for Science Majors 1 and 2; *or* PHY 1533, Physics Lab for Science Majors 3; CHM 1111, General Chemistry; CHM 1122, General Chemistry 2; CHM 1221, Analytical Chemistry; CHM 1264, CHM 1265, Organic Chemistry 1 and 2; and two additional advanced science electives approved by department Advisory Committee. Foreign language requirement.

In addition, complete the arts and sciences core curriculum (see page 2).

Chemistry

Bachelor of Arts

CHM 1151, CHM 1152, General Chemistry for Science Majors 1 and 2; CHM 1153, The Chemical Elements; CHM 1231, Analytical Chemistry for Chemistry Majors; CHM 1271, CHM 1272, CHM 1273, Organic Chemistry for Chemistry Majors and Chemical Engineering Students 1, 2, and 3; CHM 1381, CHM 1382, CHM 1383, Physical Chemistry 1, 2, and 3; CHM 1394, CHM 1395, CHM 1396, Experimental Physical Chemistry 1, 2, and 3; CHM 1422, Instrumental Methods of Analysis; and CHM 1432, Instrumental Analysis Lab.

In addition, complete the arts and sciences core curriculum (see page 2).

MTH 1143, MTH 1144, MTH 1145, Calculus 1, 2, and 3; MTH 1243, Calculus and Linear Methods 1 *or* MTH

1223, Calculus 4; PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors 1, 2, and 3; and PHY 1532, PHY 1533, Physics Lab for Science Majors 2 and 3.

Bachelor of Science

CHM 1151, CHM 1152, General Chemistry for Science Majors 1 and 2; CHM 1153, The Chemical Elements; CHM 1231, Analytical Chemistry for Chemistry Majors; CHM 1271, CHM 1272, CHM 1273, Organic Chemistry for Chemistry Majors and Chemical Engineering Students 1, 2, and 3; CHM 1381, CHM 1382, CHM 1383, Physical Chemistry 1, 2, and 3; CHM 1394, CHM 1395, Experimental Physical Chemistry 1, 2, and 3; CHM 1422, Instrumental Methods of Analysis; CHM 1432, Instrumental Analysis Lab; CHM 1441, Inorganic Chemistry; CHM 1461, Identification of Organic Compounds; CHM 1811, Advanced Chemical Lab Practice 1; and two advanced science *or* mathematics electives.

MTH 1143, MTH 1144, MTH 1145, Calculus 1, 2, and 3; MTH 1243, Calculus and Linear Methods 1, *or* MTH 1223, Calculus 4. MTH 1245, Differential Equations and Linear Methods 1; *or* MTH 1225, Mathematical Analysis; PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors 1, 2, and 3; and PHY 1532, PHY 1533, Physics Lab for Science Majors 2 and 3.

In addition, complete the arts and sciences core curriculum (see page 2).

Minor in Chemistry

After a general chemistry sequence, CHM 1231, Analytical Chemistry for Chemistry Majors; CHM 1271, CHM 1272, CHM 1273, Organic Chemistry 1, 2, and 3 for chemistry majors and chemical engineering students; CHM 1381, CHM 1382, Physical Chemistry 1 and 2; and CHM 1394, CHM 1395, Experimental Physical Chemistry 1 and 2.

Economics

Bachelor of Arts

ECN 1115, Principles of Macroeconomics; ECN 1116, Principles of Microeconomics; ECN 1250, ECN 1251, Statistics 1 and 2; ECN 1216, Microeconomic Theory; ECN 1215, Macroeconomic Theory; ECN 1337, History of Economic Thought; six economics electives.

MTH 1106, MTH 1107, Fundamentals of Mathematics 1 and 2; and four social science electives other than economics.

In addition, complete the arts and sciences core curriculum (see page 2).

Bachelor of Science

ECN 1115, Principles of Macroeconomics; ECN 1116, Principles of Microeconomics; ECN 1250, ECN 1251, Statistics 1 and 2; ECN 1216, Microeconomic Theory; ECN 1215, Macroeconomic Theory; ECN 1350, Introduction to Econometrics *or* ECN 1351, Problems in Economic Research; and ten economics electives.

MTH 1106, MTH 1107, Fundamentals of Mathematics 1 and 2; and four social science electives other than economics.

In addition, complete the arts and sciences core curriculum (see page 2).

Minor in Economics

ECN 1115, Principles of Macroeconomics; ECN 1116, Principles of Microeconomics; ECN 1216, Microeconomic Theory; ECN 1215, Macroeconomic Theory; and four electives in economics. Electives to be selected with the advice of a department adviser. Any course taken outside the Department of Economics to satisfy these economics elective requirements must be approved by a faculty adviser in the department.

English

Bachelor of Arts

ENG 1126, Backgrounds to English and American Literature; ENG 1120 and 1121, Survey of English Literature 1 and 2; ENG 1123 and 1124, Survey of American Literature 1 and 2; ENG 1307, Approaches to Literature; two period courses; three major figure courses (one must be Shakespeare); one language or writing course; one junior/senior seminar; and three electives in English.

In addition, complete the arts and sciences core curriculum (see page 2).

Bachelor of Science

ENG 1126, Backgrounds to English and American Literature; ENG 1120 and 1121, Survey of English Literature 1 and 2; ENG 1123 and 1124, Survey of American Literature 1 and 2; ENG 1307, Approaches to Literature; two period courses; three major figure courses (one must be Shakespeare); one language or writing course; one junior/senior seminar; and three electives in English.

In addition, complete the arts and sciences core curriculum (see page 2).

Minor in Literature

Six courses required. Two survey courses required from the following: ENG 1120, Survey of English Literature 1; ENG 1121, Survey of English Literature 2; ENG 1123, Survey of American Literature 1; ENG 1124, Survey of American Literature 2. One course from two of the following categories: (a) literary periods; (b) major figures; and (c) language and writing. One elective from (a), (b) or (c). A junior/senior seminar.

Minor in Writing

Six courses required, four from the following: ENG 1350, Intermediate Writing; ENG 1351, Creative Writing; ENG 1125, Technical Writing 1; ENG 1370, Technical Writing 2; ENG 1380, Writing for the Professions; Health Services; ENG 1352, Advanced Writing; ENG 1381, Writing for the Professions: Business Administration; ENG 1382, Writing for the Professions: Criminal Justice; ENG 1357, Poetry Workshop; ENG 1358, Fiction Workshop; ENG 1362, Publication Arts; ENG 1359, Nonfiction Workshop; and two electives chosen from the courses listed or literature courses.

Minor in Linguistics

See Interdisciplinary Minors.

Minor in Technical Communication

See Interdisciplinary Minors.

Geology

Bachelor of Arts in Geology

GEO 1212, Physical Geology; GEO 1213, Physical Geology Lab; GEO 1222, Historical Geology; GEO 1223, Historical Geology Lab; GEO 1310, Descriptive Mineralogy; GEO 1308, Petrology; GEO 1440, Geomorphology; GEO 1418, Structural Geology; and five geology electives.

MTH 1106, MTH 1107, Fundamentals of Mathematics 1 and 2; *or* MTH 1107, MTH 1108, Calculus 1 and 2; PHY 1231, Physics for Science Majors; *or* PHY 1201, Physics for the Life Sciences 1; CHM 1111, General Chemistry 1; and CHM 1122, General Chemistry 2.

In addition, complete the arts and sciences core curriculum (see page 2).

Bachelor of Science in Geology

GEO 1212, Physical Geology; GEO 1213, Physical Geology Lab; GEO 1222, Historical Geology; GEO 1223, Historical Geology Lab; GEO 1310, Descriptive Mineralogy; GEO 1311, Optical Crystallography; GEO 1308, Petrology; GEO 1418, Structural Geology; and eight geology electives.

MTH 1107, MTH 1108, Calculus 1 and 2, *or* MTH 1123, MTH 1124, MTH 1125, Calculus 1, 2, and 3; PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors 1, 2, and 3; CHM 1111, CHM 1122; *or* CHM 1151, CHM 1152, General Chemistry 1 and 2; CHM 1231 *or* CHM 1221, Analytical Chemistry; *or* CHM 1391, Physical Chemistry; *or* GEO 1412, Geochemistry; and two approved additional science electives.

In addition, complete the arts and sciences core curriculum (see page 2).

Minor in Geology

GEO 1212, Physical Geology; GEO 1222, Historical Geology; GEO 1308, Petrology; GEO 1213, Physical Geology Lab; GEO 1223, Historical Geology Lab; plus four geology electives (GEO 1250 or higher number) chosen with the approval of the geology department.

Bachelor of Arts in Environmental Geology

GEO 1212, Physical Geology; GEO 1213, Physical Geology Lab; GEO 1222, Historical Geology; GEO 1223, Historical Geology Lab; GEO 1308, Petrology; GEO 1440, Geomorphology; GEO 1438, Geology and Land-use Planning; and five geology electives.

MTH 1107, MTH 1108, Calculus 1 and 2, *or* MTH 1106, Fundamentals of Mathematics and MTH 1107, Functions and Basic Calculus; BIO 1103, BIO 1104, Principles of Biology 1 and 2; CHM 1111, CHM 1122, General Chemistry 1 and 2.

In addition, complete the arts and sciences core curriculum (see page 2).

Bachelor of Science in Environmental Geology

GEO 1212, Physical Geology; GEO 1213, Physical Geology Lab; GEO 1222, Historical Geology; GEO 1223, Historical Geology Lab; GEO 1308, Petrology; GEO 1440, Geomorphology; GEO 1310, Descriptive Mineralogy; GEO 1438, Geology and Land-use Planning; GEO 1442, Water in Environmental Planning; and eight geology electives.

MTH 1107, MTH 1108, Calculus 1 and 2; PHY 1231, PHY 1232, PHY 1233, Physics for Sciences Majors 1, 2, and 3, *or* BIO 1103, BIO 1104, BIO 1105, Principles of Biology 1, 2, and 3; CHM 1111, CHM 1122, General Chemistry 1 and 2; and CHM 1211, Analytical Chemistry, *or* GEO 1412, Geochemistry; and two approved additional science electives.

In addition, complete the arts and sciences core curriculum (see page 2).

Minor in Environmental Geology

GEO 1212, Physical Geology, *or* GEO 1140, Environmental Geology; GEO 1213, Physical Geology Lab; GEO 1222, Historical Geology; GEO 1223, Historical Geology Lab; GEO 1438, Geology and Land-use Planning; plus four geology electives (GEO 1250 or higher number) chosen with the approval of the geology department.

History**Bachelor of Arts**

HST 1101 and HST 1102, Western Civilization 1 and 2; HST 1201 and HST 1202, United States to 1877 and United States since 1877; HST 1241, The Historian's Craft; HST 1805, Approaches to History; nine history electives distributed as follows: two courses in Group A (ancient, medieval, early modern Europe); two courses in Group B (modern Europe); two courses in Group C (America); two courses in Group D (other regions); and one course in any of the above groups.

In addition, complete the arts and sciences core curriculum (see page 2).

Recommended: Courses in the related social sciences.

Bachelor of Science

HST 1101 and HST 1102, Western Civilization 1 and 2; HST 1201 and HST 1202, United States to 1877 and United States since 1877; HST 1241, The Historian's Craft; HST 1251, Social Science Methodology; HST 1805, Approaches to History; eleven history electives distributed as follows: two courses in Group A (ancient, medieval, and early modern Europe); two courses in Group B (modern Europe); two courses in Group C (America); two courses in Group D (other regions); and three courses in any of the above groups.

Either a social science minor that requires some theoretical *or* methodological courses; *or* a social science minor without theoretical *or* methodological courses (in which case students must take either PSY 1211, SOC 1320, *or* ECN 1250 or another acceptable

statistics course); *or* a coherent program in science *and/or* social science composed of six courses (in which case students should consult with an adviser and have the approval of the Undergraduate Committee in the Department of History); *or* a recognized minor in another college of the University (for example, Business Administration). A computer course approved by an adviser and, where applicable, a statistics course.

In addition, complete the arts and sciences core curriculum (see page 2).

Minor in History

Eight courses in history, two of which must be selected from the following: HST 1101, Western Civilization 1; HST 1102, Western Civilization 2; HST 1201, United States to 1877; and HST 1202, United States since 1877.

Human Services**Bachelor of Arts**

Prerequisite courses. SOC 1100, Introduction to Sociology, *or* ED 1100, Education and Social Science; ED 1302, The Human Services Professions; PSY 1111 and PSY 1112, Foundations of Psychology 1 and 2, *or* ED 1102 and ED 1103, Human Development and Learning 1 and 2; POL 1111, Introduction to American Government, *or* equivalent; ECN 1115 *or* ECN 1116, Principles of Macroeconomics, *or* Principles of Microeconomics, *or* equivalent.

Core courses. PSY 1211, Statistics in Behavioral Science 1, *or* SOC 1320, Introduction to Statistical Analysis, *or* ED 1307, Introduction to Educational Statistics; PSY 1511, Experimental Design in Psychology, *or* SOC 1321, Research Methods 1, *or* SOC 1324, Human Services Research and Evaluation; SOC 1240, Sociology of Human Services Organizations; PSY 1272, Personality 1; PSY 1373, Abnormal Psychology 1; CRS 1314, Introduction to Counseling; SPC 1338, Group Discussion, *or* SPC 1330, Interpersonal Communication 1, *or* ED 1317, Seminar in Group Process; CRS 1310, Intervention Strategies; *and* INT 1333, Senior Seminar.

Social and community issues. Three courses focused on subjects such as poverty and welfare, minority affairs, special needs populations, and other contemporary American social problems, chosen with the student's academic adviser.

Human services specialization. Five courses in a particular subfield of human services, chosen with the student's academic adviser.

Human services fieldwork. INT 1336, Field Experience in Human Services 1, *and* INT 1337, Field Experience in Human Services 2.

In addition, complete the arts and sciences core curriculum (see page 2).

Specialization in Deaf Studies

Prerequisite courses, core courses, and fieldwork courses follow the standard human services major.

Three social and community issues courses selected from the subjects suggested above and/or from the following specific alternatives. PSY 1271, or SOC 1135, Social Psychology; SOA 1135, Language and Culture; SOA 1101, Cultural Meaning, and Everyday Experience; ENG 1118, Introduction to Language and Linguistics; PSY 1263, Nonverbal Communication; SOC 1140, Sociology of Prejudice; SPC 1232, Female/Male Communication; and CRS 1314, Introduction to Counseling.

Deaf studies specialization. ASL 1101, American Sign Language 1; ASL 1102, American Sign Language 2; ASL 1201, Intermediate American Sign Language 1; ASL 1202, Intermediate American Sign Language 2; and five courses selected from: ASL 1211, Deaf Culture; ASL 1212, Deaf History; PSY 1363, American Sign Language Linguistics; PSY 1261, Bilingualism; SLA 1101, Introduction to Speech and Hearing; and ASL 1401, American Sign Language Literature.

Interdisciplinary Studies

Independent Major

An eligible student may petition the College Curriculum Committee to meet requirements for the BA degree in an independent major. Eligibility, procedures, and requirements must be discussed in advance with an adviser in the Office of the Dean, 400 Meserve Hall. No student may be considered for an independent major until a curriculum proposal has been submitted to, and approved by, the College Curriculum Committee.

Minor in Asian Studies

Whatever a student's major or interests, the minor in Asian Studies provides an important opportunity to augment knowledge of Asian culture, history, and politics. The minor program allows students to choose a concentration in Middle Eastern studies or East Asian studies (China, Japan, Korea). Courses cover a range of academic disciplines: anthropology, history, music, philosophy and religion, sociology, language, and political science. In each concentration, three core courses and four electives are required.

Middle Eastern studies concentration. Core courses: HST 1612, The Modern Middle East; PHL 1280, Islam; and POL 1345, Government and Politics in the Middle East. Choose four electives: ECN 1332, Economic History of Less Developed Countries; HST 1614, The Middle East Today; MUS 1182, Music of the Middle East; POL 1384, Arab-Israeli Conflict; and SOC 1310, Class, Power, and Social Change.

East Asian studies concentration. Core courses: PHL 1275, Eastern Religions; POL 1371, Government and Politics of China; and SOC 1104, Contemporary Japanese Culture and Society. Choose four electives: HST 1150, Introduction to Third World History; HST 1591, China and the United States; HST 1592, History of the Vietnam War; HST 1633, Modern China; HST 1634, Communist China; HST 1637, Modern Japan; POL 1332, Government and Politics of Japan; HST

1641, Recent Leaders of Asia; PHL 1130, Ethics: East and West; PHL 1255, Indian Philosophy; PHL 1250, Chinese Philosophy; PHL 1293, Mysticism: East and West; and POL 1372, China's Foreign Relations.

For both concentrations, it is strongly recommended that students pursue language training to gain proficiency in an Asian language. Chinese courses are currently taught in the Basic College program.

Minor in Cinema Studies

The minor in cinema studies permits students to acquire skills in the analysis of one of the major art forms and cultural influences of the twentieth century and to gain critical tools that can be used to study the relationships between film and society, history, aesthetics, performance, philosophy, and psychoanalysis. Students take eight courses, including two required courses, a filmmaking requirement, and five electives. Due to their interdisciplinary nature, many courses are listed in several departments.

Required courses. LNF 1550, Introductory Film Analysis; and LNF 1551, Film Theory.

Filmmaking requirement. One of the following: ART 1170, Filmmaking Workshop; ART 1171, Animation Workshop; ART 1180, Video Basics; or SPC 1450, Television 1.

Electives. ART 1233, Contemporary Directions in Cinema; ART 1235, History of Film; ART 1236, The American Film; ART 1238, Documentary Film; ART 1280, Media Graphics; ART 1281, Video Project; DRA 1316, Acting for the Camera; ENG 1288, Film and Text; ENG 1289, Shakespeare on Film; ENG 1290, Topics in Film (may not be counted more than twice); ENG 1291, Popular Culture; ENG 1294, Modern Film; ENG 1296, American Film and Society; ENG 1297, Approaches to Film; HST 1494, History and Film; HST 1575, History of Media in America; INT 1320, Exploring the Humanities through Film; INT 1321, Modernism; LNF 1521, French Film Masterpieces; LNF 1560, Film and Psychoanalysis; LNS 1550, Spanish Film Masterpieces; MUS 1139, Film Music; SOA 1120, Camera on Culture: Visual Anthropology; SPC 1454, Programming for Radio and Television, SPC 1455, Television 2; SPC 1554, Special Topics in Broadcasting (when appropriate).

For more information, contact the film studies coordinator, Professor Inez Hedges (320 Ryder Hall), at 617-437-5163.

Minor in Linguistics

A total of six courses is required. ENG 1118, Introduction to Language and Linguistics. Choose one course from: ENG 1401, Introduction to Syntax; PSY 1262, Language and Cognition; and PSY 1361, Introduction to Phonetics. Choose four courses from: ENG 1119, History of the English Language; *ENG 1401, Introduction to Syntax; ENG 1402, Grammars of English; ENG 1407, Introduction to Semantics; ENG 1408, Topics in Linguistics; ENG 1690, Junior/Senior Seminar (in Linguistics or Stylistics); LNL 1235 Applied Linguistics; LNL 1236, Applied Linguistics 2; PHL 1215, Symbolic Logic; PHL 1440, Philosophy

of Language; PSY 1261, Bilingualism; *PSY 1262, Language and Cognition; PSY 1263, Non-verbal Communication; *PSY 1361, Introduction to Phonetics; PSY 1362, Child Language; PSY 1363, Linguistics of American Sign Language; PSY 1364 Cognition; PSY 1365, Language and the Brain; PSY 1562, Laboratory in Psycholinguistics; PSY 1661, Seminar in Psycholinguistics; PSY 1662, Seminar in Cognition; and SOA 1135, Language and Culture.

*If not already taken.

Minor in Marine Studies

The marine studies minor provides a program of study in the multidisciplinary aspects of the marine environment. The program emphasizes either the scientific or social science/humanistic study of the oceans.

At least six marine-related courses totaling 24 QH are required. Two courses must be beyond the introductory level, and at least one course must be from the natural sciences and one from the social sciences/humanities.

Mastery of a marine-related skill such as scuba diving, piloting and navigation, or sailing is required. This can be achieved through coursework of an approved outside certification. Coursework in marine skills is normally limited to one of the six required courses.

A project involving some degree of independent study of a marine-related topic must be completed. This can be accomplished by a directed studies course in marine studies, or, with approval, by completion of a major course-related project or outside project.

For more information, contact Professor Peter Rosen, marine studies coordinator, at 617-437-3176.

Minor in Media Studies

To qualify for a minor in media studies, the student must complete a minimum of eight courses as follows. Three required courses: SPC 1250, Introduction to Mass Communication; HST 1575, History of Media in America; and SPC 1300, Introduction to Communication Theory or SPC 1317, Theories of Audience Behavior; or INT 1320, Exploring Humanities through Film; and five elective courses from the two categories media production and media application (at least two electives in each category). Individual student programs will be developed in consultation with faculty advisers. Students should contact Dr. Zaremba (Department of Speech Communication) for information on program development and elective choices.

Minor in Technical Communication

Technical communication combines written, oral, and graphics skills with a background in science or technology. The minor in technical communication gives students the opportunity to prepare themselves for careers as technical writers, or for careers in which technical communication is a significant part of their jobs. Students in English or other liberal arts

studies may elect the minor, as may students from a variety of technological or scientific fields. A student does not have to be enrolled in the College of Arts and Sciences to declare the minor.

Eight courses are required. Students must choose courses from the following areas.

Writing Courses

ENG 1125 Technical Communication 1 (Required)

Choose two of the following.

ENG 1352 Advanced Writing

ENG 1370 Technical Writing 2

ENG 1371 Writing for the Computer Industry

ENG 1380 Writing for the Professions:
Health Services

ENG 1381 Writing for the Professions:
Business Administration

One of these courses must be ENG 1370 or 1371.

Speech Communication Courses

Choose one.

SPC 1116 Business and Professional Speaking

SPC 1331 Interpersonal Communication 2

Graphic Arts Courses

JRN 1440 Design and Graphics You may take an equivalent in another department or college.

Computer Programming

COM 1101 Introduction to Computers 1 (Required)

Computer Science and Science Courses

Choose two courses, preferably both within the same discipline.

BIO 1130 General Biology

BIO 1131 Animal Biology

CHM 1111 General Chemistry

CHM 1112 General Chemistry

GE 1106 FORTRAN Programming

GEO 1212 Physical Geology

GEO 1213 Historical Geology

IIS 1125 COBOL Programming 1

PHY 1231 Physics for Science Majors 1

PHY 1232 Physics for Science Majors 2

PHY 1233 Physics for Science Majors 3

Minor in Urban Studies

Students must take 28 QH (seven courses). *Required courses (three)*: SOC 1147, Urban Society; POL 1324, Urban Politics; ECN 1320, Urban Economics. One course from each of the following four areas: *Urban Problems and Policies* (SOC 1346, Suburb and Metropolis; POL 1318, State and Local Government; ECN 1321, Urban Economic Problems and Policies), *Urban Humanities* (HST 1391, European Urban History to 1850; HST 1543, American Urban History; ENG 1608, The City in Literature), *Urban Form and Design* (ART 1113, Architecture and the City; ART 1225, Technology, Architecture, and the City; ART 1150, Introduction to Architectural Design), and *African-American Studies* (AFR 1261, Economics of Urban Poverty; AFR 1275, Urban Political Issues; AFR 1475, Public Policy Analysis).

To obtain credit for the minor, students must file a petition form with the College of Arts and Sciences. Interested students should confer with an adviser as soon as possible. Advisers are: Professor Robert Gilbert, political science, 303 Meserve Hall, 617-437-2796; Professor Clay McShane, history, 249 Meserve Hall, 617-437-2660; Professor Peter Serenyi, art and architecture, 239 Ryder Hall, 617-437-2347; Professor Gregory Wassall, economics, 317 Lake Hall, 617-437-2196.

Minor in Women's Studies

Students take a total of nine courses: four required interdisciplinary courses and five electives.

Required interdisciplinary courses. HST 1490/INT 1150 Introduction to Women's Studies; SOC 1302/INT 1302 Female Perspectives on Society; INT 1151, Seminar in Research 1; and INT 1152, Seminar in Research 2.

Elective Courses. AFR 1241, Black Family; AFR 1480, Black Man/Black Woman; BIO 1187, Biology of Human Reproduction; CJ 1616, Women and the Criminal Justice System; ECN 1312, Women in the Labor Market; ENG 1551, Gender Roles in Literature; ENG 1600, Topics in Literature; ENG 1602, Major Figure; other literature courses when gender-oriented; HST 1392, Women in European History to 1815; HST 1472, The Family in European History; HST 1473, Women in Modern Europe; HST 1554, Women in America; HST 1644, Third World Women; LNF 1560, Film and Psychoanalysis; LNS 1510, Saints and Sinners; MUS 1106, Women in Music; MUS 1800, Directed Study; NUR 1303, Life Crisis: Analysis and Response; PHL 1295, Medicine, Religion, and the Healer's Art; POL 1316, Contemporary Revolutionary Politics; POL 1327, Sex Roles in American Politics; POL 1328, Women in Public Management; PSY 1218, Psychology of Women; SOA 1160, Sex, Sex Roles, and the Family; SOA 1301, Human Origins; SOA 1303, Sexuality and Culture; SOC 1155, Sociology of the Family; SOC 1160, Sex-Gender Roles in a Changing Society; SOC 1177, Social Roles in the Business World; SOC 1178, Women Working; SOC 1217, Women, Health, and Social Change; and SPC 1232, Female/Male Communication.

Graduate courses offered as electives. English: Topics in Literature courses accepted when focused on women; HST 3370, Seminar in History of the Family; HST 3399, Seminar in Approaches to Women's History; POL 3665, Women in Public Management; POL 3667, Equal Opportunity in Public Administration; POL 3668, Legal Issues in Public Personnel Administration; SOA 3102, Class and State Formation; SOA 3156, Gender, Kinship, and Social Change; SOC 3155, The Family; SOC 3160, Women, Men, and Social Change; SOC 3175, Sociology of Work; SOC 3304, Feminist Theory; and SOC 3410, Contemporary Issues in Sociology.

These courses represent the most current listing. New courses are continually being developed and added to the program. For more information and the

most recent brochure describing the Women's Studies Program, contact Professor Laura Frader at 617-437-4442.

Journalism

Bachelor of Arts Bachelor of Science

Each major will complete the journalism core and one of four concentrations—newspaper/print, radio-television news, advertising, or public relations—to correspond with his/her career objective.

Journalism core. JRN 1501, History of Journalism; JRN 1512, Journalism, Ethics and Issues; JRN 1103, Newswriting 1; JRN 1104, Newswriting 2; JRN 1206, Editing; JRN 1508, Law of the Press; and JRN 1301, Photojournalism.

Newspaper/print concentration. JRN 1305, Techniques of Journalism; JRN 1432, Local Government Reporting; JRN 1440, Design and Graphics; JRN 1575, Publication Production and Management; and one journalism elective.

Radio-television news concentration. JRN 1320, Radio News Gathering and Writing; JRN 1421, Television Newswriting; JRN 1422, Television News Production; JRN 1894, Directed Study; and one journalism elective.

Public relations concentration. JRN 1336, Public Relations Principles; JRN 1440, Design and Graphics; JRN 1460, Public Relations Problems; JRN 1561, Public Relations Practice; and one journalism elective.

Advertising concentration. JRN 1440, Design and Graphics; JRN 1350, Advertising Principles; JRN 1451, Advertising Copy Writing; JRN 1552, Advertising Practice; and one journalism elective.

Each major will complete the following related requirements.

ENG 1275, Grammar for Journalists; ENG 1110, Freshman English 1; ENG 1111, English 2. One course from this list: ENG 1120, Survey of English Literature 1; ENG 1121, Survey of English Literature 2; ENG 1123, Survey of American Literature 1; ENG 1124, Survey of American Literature 2; and one additional English or American literature elective.

POL 1310, American Ideology; POL 1318, State and Local Government; HST 1201, United States to 1877; HST 1202, United States since 1877; ECN 1115, Principles of Macroeconomics; and one additional course in economics or business; MTH 1152 Statistical Thinking; PHL 1200, Introduction to Logic 1; PHL 1140, Social and Political Philosophy; two history electives; and COP 1135, Professional Development for Journalists.

MUS 1109, Introduction to Art, Drama, and Music or one course from each of the following categories—(a): ART 1106, Introduction to Art; ART 1220, American Sculpture and Painting; (b): MUS 1100, Music 1; MUS 1101, Music as a Listening Experience.

Bachelor of Arts

In addition to the journalism and related requirements above, candidates for the bachelor of arts degree will complete three courses in science and/or math.

Students must also complete the arts and sciences core curriculum (see page 2).

Bachelor of Science

In addition to the journalism and related requirements above, candidates for the bachelor of science degree will complete six courses in sciences and/or math.

Students must also complete the arts and sciences core curriculum (see page 2).

Linguistics

Bachelor of Arts

General requirements. ENG 1118, Introduction to Language and Linguistics; PSY 1262, Language and Cognition; PSY 1361, Introduction to Phonetics; SOA 1135, Language and Culture; ENG 1401, Introduction to Syntax; and PHL 1215, Symbolic Logic.

Second Language Requirement. Proficiency through Intermediate 2 level plus two advanced courses. The college language placement procedures determine proficiency in a spoken second language (see bachelor of science for proficiency in American Sign Language).

Additional courses. Five courses from the following: PSY 1261, Bilingualism; PSY 1362, Child Language; PSY 1363, Linguistics of American Sign Language; PSY 1364, Cognition; PSY 1365, Language and the Brain; PSY 1264, Animal Communication; PSY 1263, Nonverbal Communication; PHL 1440, Philosophy of Language; ENG 1119, History of the English Language; ENG 1402, Grammars of English; ENG 1407, Introduction to Semantics; ENG 1408, Topics in Linguistics; LNL 1235, Applied Linguistics; and LNL 1236, Advanced Applied Linguistics.

Lab course. PSY 1562, Laboratory in Psycholinguistics.

Seminar. Two from the following: ENG 1690, ENG 1691, Junior, Senior Seminar (linguistics, stylistics); PSY 1661, Seminar in Psycholinguistics; or PSY 1661, Seminar in Cognition.

Practicum. One course in fieldwork, directed study, sign language teaching, or interpreting.

In addition, complete the arts and sciences core curriculum (see page 2).

Bachelor of Science

Same requirement as the bachelor of arts, except that American sign language can count toward the second-language proficiency requirement.

In addition, complete the arts and sciences core curriculum (see page 2).

Mathematics

Bachelor of Arts

MTH 1143, MTH 1144, MTH 1145, Calculus 1, 2, and 3; MTH 1243, MTH 1244, Calculus and Linear Methods 1 and 2; MTH 1245, MTH 1246, Differential Equations and Linear Methods 1 and 2; MTH 1238, Combinatorial Mathematics; MTH 1301, Linear Algebra; MTH 1311, Analysis 1; and three approved mathematics electives selected in consultation with an adviser.

PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors 1, 2, and 3.

In addition, complete the arts and sciences core curriculum (see page 2).

Bachelor of Science

MTH 1143, MTH 1144, MTH 1145, Calculus 1, 2, and 3; MTH 1243, MTH 1244, Calculus and Linear Methods 1 and 2; MTH 1245, MTH 1246, Differential Equations and Linear Methods 1 and 2; MTH 1238, Combinatorial Mathematics; MTH 1301, Linear Algebra; MTH 1311, Analysis 1; and six approved mathematics electives selected in consultation with an adviser.

PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors 1, 2, and 3.

In addition, complete the arts and sciences core curriculum (see page 2).

Modern Languages

Bachelor of Arts

Eight advanced electives in the major language,* and two advanced electives in the minor language.*

ENG 1120, ENG 1121, Survey of English Literature 1 and 2; and four history electives.

In addition, complete the arts and sciences core curriculum (see page 2).

Bachelor of Science

The bachelor of science program is offered in Spanish and French. The requirement is twelve advanced electives in the major language, including two conversation and composition courses; six advanced electives in the minor language,* including two conversation and composition courses; two history electives.

In addition, complete the arts and sciences core curriculum (see page 2).

Minor in Modern Language

The Department of Modern Languages also offers a minor program for students whose major lies in other disciplines. The general requirement is *six* advanced courses (beyond the 1104 level) in the language. Interested students should consult with Professor Modée, 617-437-2237, about specific course requirements.

Minor in Russian Studies

Language proficiency. Students must demonstrate proficiency in Russian language by either completing

*Courses beyond the intermediate level.

LNR 1104, Intermediate Russian 2, or by passing the Russian language proficiency exam.

Nine courses are required including four courses in Russian language and literature. If necessary, the following courses may be used to attain required proficiency in the Russian language: LNR 1101, Elementary Russian 1; LNR 1102, Elementary Russian 2; LNR 1103, Intermediate Russian 1; LNR 1104, Intermediate Russian 2; LNR 1201, Russian Composition and Conversation 1; LNR 1202, Russian Composition and Conversation 2; LNR 1203, Advanced Russian Proficiency 1; LNR 1204, Advanced Russian Proficiency 2; LNR 1500, Russian Culture; LNR 1511, Russian Literature Translation; LNR 1801, Directed Study; or LNR 1802, Directed Study.

Two courses in Russian and Soviet history and culture from the following: HST 1451, Imperial Russia; HST 1452, Soviet Russia; or LNR 1500, Russian Culture. Two courses in political science from the following: POL 1347, Soviet Government; POL 1348, Soviet Foreign Policy; or a graduate course where permitted by the instructor. One additional course in any of the above categories or any other course or directed study approved by the minor adviser.

Interested students should consult the Department of Modern Languages, 617-437-2234.

Music

Bachelor of Arts

Concentration in music literature. MUS 1107, Principles of Music Literature; MUS 1201, Theory 1; MUS 1202, Theory 2; MUS 1203, Theory 3; MUS 1204, Theory 4; MUS 1301, Form and Analysis 1; MUS 1302, Form and Analysis 2; MUS 1209, Functional Piano; MUS 1121, Medieval and Renaissance Music; MUS 1122, Music of the Baroque Era; MUS 1123, Music of the Classical Era; MUS 1124, Music of the Romantic Era; MUS 1125, Twentieth-Century Music; ART 1106, Introduction to Art; DRA 1100, Introduction to Theatre Arts; and four approved music electives.

Ensembles: Students must participate in at least one Northeastern University performing ensemble during at least eight of their quarters on campus.

In addition, complete the arts and sciences core curriculum (see page 2).

Concentration in music literature and performance. MUS 1107, Principles of the Music Literature; MUS 1201, Theory 1; MUS 1202, Theory 2; MUS 1203, Theory 3; MUS 1204, Theory 4; MUS 1301, Form and Analysis 1; MUS 1209, Functional Piano; MUS 1122, Music of the Baroque Era, MUS 1123, Music of the Classical Era; MUS 1124, Music of the Romantic Era; MUS 1125, Twentieth-Century Music; MUS 1461, Applied Music Lessons (taken six times); ART 1106, Introduction to Art; DRA 1100, Introduction to Theatre Arts; and three approved music electives.

Ensembles: Students must participate in at least one Northeastern University performing ensemble during at least eight of their quarters on campus.

In addition, complete the arts and sciences core curriculum (see page 2).

Concentration in music industry. MUS 1107, Principles of Music Literature; MUS 1201, Theory 1; MUS 1202, Theory 2; MUS 1203, Theory 3; MUS 1209, Functional Piano; MUS 1165, Music Industry 1; MUS 1166, Music Industry 2; MUS 1167, Music Administration; MU 1170, Music and Technology; MUS 1365, Seminar: Topics in Music Industry; MUS 1172, The Recording Studio; ECN 1115, Principles of Macroeconomics; ECN 1116, Principles of Microeconomics; MGT 1115, Introduction to Business; ACC 1210, Introduction to Accounting; FIN 1438, Introduction to Finance; MKT 1435, Introduction to Marketing; HRM 1432, Organizational Behavior; SPC 1452, Radio 1; ART 1106, Introduction to Art or DRA 1100, Introduction to Theatre Arts; descriptive or inferential statistics (MTH 1387 and 1390 or ECN 1250 and 1251 or POL 1301 and 1302); MSC 1441, Operations Management or ENT 1330, Management of Smaller Enterprises; and three approved music electives.

Ensembles: Students must participate in at least one Northeastern University performing ensemble during at least four of their quarters on campus.

In addition, complete the arts and sciences core curriculum (see page 2).

Bachelor of Science

Concentration in music industry. MUS 1107, Principles of Music Literature; MUS 1201, Music Theory 1; MUS 1202, Music Theory 2; MUS 1203, Music Theory 3; MUS 1209, Functional Piano; MUS 1225, Music of the Twentieth Century. Any two of the following four courses: MUS 1121, Medieval and Renaissance Music; MUS 1222, Music of the Baroque Era; MUS 1223, Music of the Classical Era; MUS 1224, Music of the Romantic Era. MUS 1180, Introduction to World Music or one other approved course in non-Western music. MUS 1165, Music Industry 1; MUS 1166, Music Industry 2; MUS 1167, Music Administration; MUS 1170, Music and Technology; MUS 1172, The Recording Studio; MUS 1365, Seminar: Topics in Music Industry; ECN 1115, Principles of Macroeconomics; ECN 1116, Principles of Microeconomics. Two of the following three pairs of courses in descriptive and inferential statistics: MTH 1387 and 1390; ECN 1250 and 1251; POL 1301 and 1302; MGT 1115, Introduction to Business; ACC 1210, Introduction to Accounting; FIN 1438, Introduction to Finance; MKT 1435, Introduction to Marketing; HRM 1432, Organizational Behavior. One of the following: MSC 1441, Operations Management; ENG 1330, Management of Smaller Enterprises; HST 1102, Western Civilization 2; SPC 1452, Radio 1. One of the following: ART 1106, Introduction to Art (or another approved art course); DRA 1100, Introduction to Theatre Arts (or another approved course in theatre).

Ensembles: Students must participate in at least one Northeastern University performing ensemble during at least four of their quarters on campus.

In addition, complete the arts and sciences core curriculum (see page 2).

Minor in Music

MUS 1201, MUS 1202, MUS 1203, Theory 1, 2, and 3; MUS 1241, Piano Class 1; MUS 1120, Survey of Music History; one approved music elective; any *one* of the following courses: MUS 1121, Medieval and Renaissance Music; MUS 1122, Music of the Baroque Era; MUS 1123, Music of the Classical Era; MUS 1124, Music of the Romantic Era; or MUS 1125, Music of the Twentieth Century.

Philosophy

Bachelor of Arts

Bachelor of Science

PHL 1225, Ancient Philosophy; PHL 1230, Modern Philosophy; PHL 1200, Introduction to Logic 1; or PHL 1215, Symbolic Logic; PHL 1400, Theory of Knowledge; or PHL 1405, Metaphysics; or PHL 1335, Moral Philosophy; one philosophy seminar; and eight philosophy electives.

In addition, complete the arts and sciences core curriculum (see page 2).

Minor in Philosophy

To qualify for a minor in philosophy, a student must take 28 QH in philosophy to be distributed as follows.

Introductory courses. PHL 1100, Introduction to Philosophy 1; or PHL 1105, Introduction to Scientific Method; *History of philosophy.* PHL 1225, Ancient Philosophy; or PHL 1230, Modern Philosophy. *Logic requirement.* PHL 1200, Introduction to Logic 1; or PHL 1215, Symbolic Logic. At least one of the following courses: PHL 1142, Philosophy of Mind; PHL 1400, Theory of Knowledge; and PHL 1405, Metaphysics; PHL 1335, Moral Philosophy.

Electives. Three electives; and three electives in philosophy.

Physics

Bachelor of Arts

PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors 1, 2, and 3, and associated labs—PHY 1531, PHY 1532, PHY 1533; PHY 1301, Intermediate Mechanics; PHY 1302, Electric and Magnetic Fields; three upper-level physics lecture courses, and three upper-level lab courses.

MTH 1143, MTH 1144, MTH 1145, Calculus 1, 2, and 3; MTH 1243, MTH 1244, Calculus and Linear Methods 1 and 2; and one advanced mathematics elective.

In addition, complete the arts and sciences core curriculum (see page 2).

Bachelor of Science

PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors 1, 2, and 3, and associated labs—PHY 1531, PHY 1532, PHY 1533; PHY 1301, Intermediate Mechanics; PHY 1302, Electric and Magnetic Fields; PHY 1303, Modern Physics; PHY 1304, Mathematical Physics; PHY 1305, Thermodynamics and Kinetic

Theory; PHY 1401, Classical Mechanics; PHY 1402, PHY 1403, Electricity and Magnetism 1 and 2; PHY 1404, Wave Motion and Optics; and three upper-level lab courses.

MTH 1143, MTH 1144, MTH 1145, Calculus 1, 2, and 3; MTH 1243, MTH 1244, Calculus and Linear Methods 1 and 2; MTH 1245, MTH 1246, Differential Equations and Linear Methods 1 and 2; and five additional electives from those approved for majors in the following fields: physics, mathematics, computer science, chemistry, engineering, biology, and geology.

In addition, complete the arts and sciences core curriculum (see page 2).

Bachelor of Science in Applied Physics

PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors 1, 2, and 3, and associated labs—PHY 1531, PHY 1532, PHY 1533; PHY 1301, Intermediate Mechanics; PHY 1302, Electric and Magnetic Fields; PHY 1303, Modern Physics; PHY 1305, Thermodynamics and Kinetic Theory; PHY 1404, Wave Motion and Optics; PHY 1551 and PHY 1552, Electronics for Scientists 1 and 2; PHY 1555, Wave Lab; PHY 1557, Advanced Lab; and PHY 1561, Project Lab.

MTH 1143, MTH 1144, MTH 1145, Calculus 1, 2, and 3; MTH 1243, MTH 1244, Calculus and Linear Methods 1 and 2; MTH 1245, MTH 1246, Differential Equations 1 and 2.

COM 1100, COM 1101, Pascal 1 and 2; COM 1201, Data Structures. Four additional electives from those approved for majors in the following fields: physics, mathematics, chemistry, computer science, engineering, biology, and geology.

In addition, complete the arts and sciences core curriculum (see page 2).

Minor in Physics

PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors 1, 2, and 3 or PHY 1221, PHY 1222, PHY 1223, PHY 1224, Physics for Engineering Students 1, 2, 3, and 4; and three upper-level lecture or lab courses from the following list: PHY 1301, PHY 1302, PHY 1303, PHY 1304, PHY 1305, PHY 1401, PHY 1402, PHY 1403, PHY 1404, PHY 1411, PHY 1412, PHY 1413, PHY 1414, PHY 1415, PHY 1416, PHY 1551, PHY 1552, and PHY 1555.

Instrumentation for Science Major

PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors 1, 2, and 3; or PHY 1221, PHY 1222, PHY 1223, Physics for Engineering Students 1, 2, and 3.

PHY 1555, Wave Lab; PHY 1551, PHY 1552, Electronics for Scientists 1 and 2; and PHY 1557, Advanced Lab.

Political Science

Bachelor of Arts

POL 1110, Introduction to Politics; POL 1111, Introduction to American Government; POL 1112, Introduction to International Relations; POL 1113, Introduction to Foreign Governments and Societies;

POL 1261, Public Administration; one political theory/thought course selected from the following: POL 1370, POL 1373, POL 1374; and seven political science electives.

Six social science electives selected from at least three of the following areas: African-American studies, anthropology, economics, history, psychology (consult the political science department's approved psychology course list), and sociology.

In addition, complete the arts and sciences core curriculum (see page 2).

Bachelor of Science

POL 1110, Introduction to Politics; POL 1111, Introduction to American Government; POL 1112, Introduction to International Relations; POL 1113, Introduction to Foreign Governments and Societies; POL 1261, Public Administration; POL 1301, Research Methods 1; POL 1302, Research Methods 2; and one political theory/thought course selected from the following: POL 1370, POL 1373, POL 1374; and six political science electives.

Six social science electives selected from at least three of the following areas: African-American studies, anthropology, economics, history, psychology (consult the political science department's approved psychology course list), and sociology.

In addition, complete the arts and sciences core curriculum (see page 2).

Concentration in Law and Legal Issues

Bachelor of Arts

POL 1110, Introduction to Politics; POL 1111, Introduction to American Government; POL 1261, Public Administration; POL 1373, Pre-Modern Political Thought or POL 1374, Modern Political Thought; six law-related electives; and four general political science electives.

Six social science electives selected from at least three of the following areas: African-American studies, anthropology, economics, history, psychology (consult the political science department's approved psychology course list), and sociology.

In addition, complete the arts and sciences core curriculum (see page 2).

Bachelor of Science

POL 1110, Introduction to Politics; POL 1111, Introduction to American Government; POL 1261, Public Administration; POL 1301, Research Methods 1; POL 1302, Research Methods 2; POL 1373, Pre-Modern Political Thought or POL 1374, Modern Political Thought; six law-related electives; and two general political science electives.

Six social science electives selected from at least three of the following areas: African-American studies, anthropology, economics, history, psychology (consult the political science department's approved psychology course list), and sociology.

In addition, complete the arts and sciences core curriculum (see page 2).

Concentration in Public Administration

Bachelor of Science

POL 1110, Introduction to Politics; POL 1111, Introduction to American Government; POL 1261, Public Administration; POL 1301, Research Methods 1; POL 1302, Research Methods 2; POL 1373, Pre-Modern Political Thought or POL 1374, Modern Political Thought; six law-related electives; and two general political science electives.

Six social science electives selected from at least three of the following areas: African-American studies, anthropology, economics, history, psychology, (consult political science department's approved psychology course list) and sociology.

In addition, complete the arts and sciences core curriculum (see page 2).

Minor in Political Science

Any two of the following courses: POL 1110, Introduction to Politics; POL 1111, Introduction to American Government; POL 1112, Introduction to International Relations; POL 1113, Introduction to Foreign Governments and Societies; POL 1261, Public Administration. Any five additional courses offered by the Department of Political Science for political science majors, including courses listed above that have not been selected to fulfill the above requirement.

Minor in International Politics

POL 1112, Introduction to International Relations; POL 1113, Introduction to Foreign Governments and Societies; any five additional courses in international politics and/or comparative politics offered by the Department of Political Science.

Psychology

Bachelor of Arts and Bachelor of Science

Psychology courses (basic courses). PSY 1110, Perspectives in Psychology 1 or PSY 1111, Foundations of Psychology 1; and PSY 1112, Foundations of Psychology 2 or PSY 1113, Perspectives in Psychology 2; PSY 1211 and PSY 1212, Statistics in Behavioral Science 1 and 2.

Specialty courses. Students choose two courses from the following: PSY 1271, Social Psychology; PSY 1272, Personality 1 or PSY 1373, Abnormal Psychology 1; and PSY 1241, Human Behavioral Development 1. Students also choose three courses from the following: PSY 1262, Language and Cognition; PSY 1231, Learning and Motivation; PSY 1351, Neuropsychology; and PSY 1381, Sensation or PSY 1382, Perception for bachelor of arts or bachelor of science degrees below.

Within the psychology department, students may concentrate their electives in a variety of subareas, including: language and cognition; learning and motivation; personality and social psychology; sensory

and neuropsychology; or individual study. Students should see a department adviser regarding these concentrations.

Additional Requirements for Bachelor of Arts

Four psychology electives; *either* three psychology labs and one psychology directed study *or* one psychology seminar; *or* two psychology labs, one psychology directed study, and one psychology seminar. Complete the arts and sciences core curriculum (see page 2).

Additional Requirements for Bachelor of Science

Seven psychology electives; *either* four psychology labs *or* three psychology labs and one psychology directed study; one psychology seminar.

Four mathematics, science, or computer science courses beyond the core curriculum requirements. Also, one humanities course beyond the core curriculum requirements. Complete the arts and sciences core curriculum (see page 2).

Minor in Psychology

Psychology courses (basic courses). PSY 1110, Perspectives in Psychology 1 *or* PSY 1111, Foundations of Psychology 1; and PSY 1112, Foundations of Psychology 2 *or* PSY 1113, Perspectives in Psychology 2; and PSY 1211 and PSY 1212, Statistics in Behavioral Science 1 and 2.

Specialty courses. Students choose two courses from the following: PSY 1271, Social Psychology; PSY 1272, Personality 1 *or* PSY 1373, Abnormal Psychology 1; PSY 1241, Human Behavioral Development 1; PSY 1262, Language and Cognition; PSY 1231, Learning and Motivation; PSY 1351, Neuropsychology; and PSY 1381, Sensation *or* PSY 1382, Perception.

Students also must take three other psychology courses and one psychology lab.

Sociology-Anthropology Concentration in Sociology

Bachelor of Arts

Preparatory requirements. SOC 1100, Introduction to Sociology; and SOA 1100, Peoples and Cultures; *Core requirements.* SOC 1320, Introduction to Statistical Analysis; SOC 1321, SOC 1322, Research Methods 1 and 2; SOC 1300, Classical Social Thought; SOC 1301, Current Social Thought; SOC 1310, Class, Power, and Social Change. *Elective requirements.* Two intermediate courses (1100 or 1200 level); two advanced courses (1300, 1400, or 1500 level); and one anthropology course beyond SOA 1100.

Six electives in the social sciences other than sociology/anthropology.

In addition, complete the arts and sciences core curriculum (see page 2).

Bachelor of Science

Preparatory requirements. SOC 1100, Introduction to Sociology and SOA 1100, Peoples and Cultures; *Core requirements.* SOC 1320, Introduction to Statistical Analysis; SOC 1321, SOC 1322, Research Meth-

ods 1 and II; SOC 1300, Classical Social Thought; SOC 1301, Current Social Thought; SOC 1310, Class, Power, and Social Change. *Elective requirements.* Two intermediate courses (1100 or 1200 level); two advanced courses (1300, 1400, or 1500 level); and one anthropology course beyond SOA 1100.

Six electives in the social sciences other than sociology/anthropology. Approved six-course specialization.

In addition, complete the arts and sciences core curriculum (see page 2).

Minor in Sociology

Requirements. SOC 1100, Introduction to Sociology; any two courses from among the following: SOC 1321, Research Methods 1; SOC 1322, Research Methods 2; SOC 1300, Classical Social Thought; SOC 1301, Current Social Thought; any three-course specialization in sociology arranged between the student and adviser; and one additional 1300, 1400, or 1500 level course.

Concentration in Anthropology

Bachelor of Arts

Preparatory requirements. SOA 1100, Peoples and Cultures; and SOC 1100, Introduction to Sociology. *Core Requirements:* at least three of the following: SOA 1335, Language and Communication; SOA 1155, Individual and Culture; SOA 1301, Human Origins; SOA 1160, Sex, Sex Roles, and Family; SOA 1425, Cultural Survival; SOA 1146, Peasants: Community, Culture, and Rebellion; SOA 1470, Myth and Religion. *Elective requirements.* At least six additional anthropology courses; and one sociology elective beyond SOC 1100.

Six electives in the social sciences other than sociology/anthropology.

In addition, complete the arts and sciences core curriculum (see page 2).

Bachelor of Science

Preparatory requirements. SOA 1100, Peoples and Cultures; and SOC 1100, Introduction to Sociology. *Core requirements.* At least three of the following: SOA 1335, Language and Communication; SOA 1155, Individual and Culture; SOA 1301, Human Origins; SOA 1160, Sex, Sex Roles, and Family; SOA 1425, Cultural Survival; SOA 1146, Peasants: Community, Culture, and Rebellion; SOA 1470, Myth and Religion. *Elective requirements.* At least six additional anthropology courses; and one sociology elective beyond SOC 1100.

Six electives in the social sciences other than sociology/anthropology. Approved five-course specialization.

In addition, complete the arts and sciences core curriculum (see page 2).

Minor in Anthropology

Requirements. SOA 1100, Peoples and Cultures; SOA 1335, Language and Communication; SOA 1155, Indi-

vidual and Culture; SOA 1160, Sex, Sex Roles, and Family; and any two-course specialization in anthropology arranged between the student and adviser.

Speech Communication Concentration in General Speech Communication

Bachelor of Arts
Bachelor of Science

Required courses. SPC 1115, Introduction to Communication Skills; SPC 1116, Business and Professional Speaking; SPC 1250, Introduction to Mass Communication; SPC 1300, Introduction to Communication Theory; SPC 1330, Interpersonal Communication 1; and SPC 1600, Introduction to Communication Research or SPC 1610, Rhetorical Criticism.

Eight speech communication electives selected in consultation with an adviser.

In addition, complete the arts and sciences core curriculum (see page 2).

Concentration in Communication Research and Theory

Bachelor of Arts
Bachelor of Science

Required courses. SPC 1115, Introduction to Communication Skills; SPC 1116, Business and Professional Speaking; SPC 1250, Introduction to Mass Communication; SPC 1300, Introduction to Communication Theory; SPC 1310, Rhetorical Theory 1; SPC 1315, Theories of Persuasion; SPC 1317, Theories of Audience Behavior; SPC 1330, Interpersonal Communication 1; SPC 1600, Introduction to Communication Research; and SPC 1610, Rhetorical Criticism.

Five of the following courses. SPC 1318, Negotiation Skills; SPC 1410, Contemporary Public Address; SPC 1430, Organizational Communication; SPC 1437, Consultation Skills; SPC 1451, Foundations of Broadcasting; SPC 1555, Communication and the Quality of Life; SPC 1890, Directed Study; and SPC 1895, Internship.

In addition, complete the arts and sciences core curriculum (see page 2).

Concentration in Radio and Television

Bachelor of Arts
Bachelor of Science

Required courses. SPC 1115, Introduction to Communication Skills; SPC 1116, Business and Professional Speaking; SPC 1250, Introduction to Mass Communication; SPC 1300, Introduction to Communication Theory; SPC 1330, Interpersonal Communication 1; SPC 1450, Television 1; SPC 1451, Foundations of Broadcasting; SPC 1452, Radio 1; and SPC 1600, Introduction to Communication Research or SPC 1610, Rhetorical Criticism.

Five of the following courses. SPC 1111, Oral Interpretation; SPC 1317, Theories of Audience Behavior; SPC 1430, Organizational Communication; SPC 1431, Mass Communication and the Organization; SPC 1453, Broadcast Management; SPC 1454, Special Topics (with permission of adviser); SPC 1455, Television 2; SPC 1500, Special Topics in Speech Communication (with permission of adviser); SPC 1890, Directed Study; SPC 1895, Internship; JRN 1422, Television News Production; and SPC 1555, Communication and the Quality of Life.

In addition, complete the arts and sciences core curriculum (see page 2).

Concentration in Interpersonal and Organizational Communication

Bachelor of Arts
Bachelor of Science

Required courses. SPC 1115, Introduction to Communication Skills; SPC 1116, Business and Professional Speaking; SPC 1250, Introduction to Mass Communication; SPC 1300, Introduction to Communication Theory; SPC 1330, Interpersonal Communication 1; SPC 1331, Interpersonal Communication 2; SPC 1338, Group Discussion; SPC 1430, Organizational Communication; and SPC 1600, Introduction to Communication Research or SPC 1610, Rhetorical Criticism.

Five of the following courses. SPC 1232, Female/Male Communication; SPC 1315, Theories of Persuasion; SPC 1318, Negotiation Skills; SPC 1431, Mass Communication and the Organization; SPC 1437, Consultation Skills; SPC 1500, Special Topics in Speech Communication (with permission of adviser); and SPC 1555, Communication and the Quality of Life.

In addition, complete the arts and sciences core curriculum (see page 2).

Concentration in Rhetoric, Advocacy, and Public Address

Bachelor of Arts
Bachelor of Science

Required courses. SPC 1115, Introduction to Communication Skills; SPC 1116, Business and Professional Speaking; SPC 1250, Introduction to Mass Communication; SPC 1300, Introduction to Communication Theory; SPC 1330, Interpersonal Communication; SPC 1600, Introduction to Communication Research or SPC 1610, Rhetorical Criticism; SPC 1310, Rhetorical Theory or SPC 1315, Theories of Persuasion; SPC 1110, Voice and Articulation or SPC 1111, Oral Interpretation or SPC 1338, Group Discussion; and SPC 1239, Argumentation and Debate or SPC 1410, Contemporary Public Address or SPC 1415, Persuasive Techniques.

Five of the following courses. SPC 1110, Voice and Articulation; SPC 1111, Oral Interpretation; SPC 1239, Argumentation and Debate; SPC 1240, Competitive

Strategies in Oral Communication; SPC 1310, Rhetorical Theory; SPC 1315, Theories of Persuasion; SPC 1317, Theories of Audience Behavior; SPC 1318, Negotiation Skills; SPC 1338, Group Discussion; SPC 1410, Contemporary Public Address; SPC 1415, Persuasive Techniques; SPC 1450, Television 1; SPC 1452, Radio 1; SPC 1500, Special Topics in Speech Communication (with permission of adviser); SPC 1600, Introduction to Communication Research; SPC 1890, Directed Study; SPC 1895, Internship; and SPC 1555, Communication and the Quality of Life.

Minor in Speech

Required courses. SPC 1116, Business and Professional Speaking; SPC 1300, Introduction to Communication Theory; SPC 1330, Interpersonal Communication 1; and SPC 1338, Group Discussion.

Four of the following courses. SPC 1110, Voice and Articulation; SPC 1111, Oral Interpretation; SPC 1232, Female/Male Communication; SPC 1239, Argumentation and Debate; SPC 1240, Competitive Strategies in Oral Communication; SPC 1250, Introduction to Mass Communication; SPC 1315, Theories of Audience Behavior; SPC 1318, Negotiation Skills; SPC 1331, Interpersonal Communication 2; SPC 1410, Contemporary Public Address; SPC 1415, Persuasive Techniques; SPC 1437, Consultation Skills; and SPC 1600, Introduction to Communication Research.

Theatre and Dance

Bachelor of Arts

Bachelor of Science

Theatre majors have the opportunity, after the completion of 32 QH, to select one of three concentrations: theatre generalist, production, or performance. Admission to a concentration is by petition or audition.

All theatre majors are required to complete the following department core courses: DRA 1100, Introduction to the Theatre Arts; DRA 1106, Theatre History 1; DRA 1107, Theatre History 2; DRA 1112, Dramatic Theory/Criticism; DRA 1114, Masters of Theatre; DRA 1149, Script Analysis; DRA 1150, Acting 1; DRA 1180, Concepts of Direction; DRA 1200, Stagecraft; DRA 1212, Introduction to Theatrical Design; and DRA 1800, DRA 1801, DRA 1802, and DRA 1803, Practicum in Production. All theatre majors must take ENG 1658, Introduction to Shakespeare, in the college core curriculum.

All theatre majors should select the following courses in their *freshman* year: DRA 1100, Introduction to Theatre Arts; DRA 1150, Acting 1; DRA 1200, Stagecraft; and DRA 1212, Introduction to Theatrical Design.

The following lists specify the requirements for each concentration.

Theatre Generalist. DRA 1116, American Theatre or DRA 1121, Contemporary Theatre; DRA 1210, Scene Design 1; DRA 1226, Lighting for the Stage; DRA 1261, Costuming 1; DRA 1505, Continental Theatre; DRA 1510, Twentieth Century Theatre; and four courses from the following group: DRA 1140, Playwriting; DRA 1160, Body Movement 1; DRA 1280, Stage Makeup; DRA 1284, Theatre Management; DRA 1325, Musical Theatre Technique; or DRA 1410, Technical Production.

Production. DRA 1209, Theatrical Drafting; DRA 1210, Scene Design 1; DRA 1226, Lighting for the Stage; DRA 1261, Costuming 1; DRA 1284, Theatre Management; DRA 1410, Technical Production; DRA 1505, Continental Drama; DRA 1510, Twentieth Century Theatre; and two courses from the following list: DRA 1213, Scene Design 2; DRA 1225, Scene Painting; DRA 1265, Pattern Drafting; DRA 1280, Stage Makeup; DRA 1400, Costuming 2; or DRA 1430, Lighting 2. All production concentration majors must take electives ART 1101, Art History Since 1400 and ART 1124, Creative Drawing.

Performance. DRA 1116, American Theatre or DRA 1121, Contemporary Theatre; DRA 1155, Voice for the Theatre; DRA 1160, Body Movement 1; DRA 1280, Stage Makeup; DRA 1301, Acting 3; DRA 1302, Acting 4; DRA 1316, Acting for the Camera; DRA 1325, Musical Theatre Technique; DRA 1505, Continental Drama; and DRA 1510, Twentieth Century Theatre. All performance concentration majors must take 4 QH of dance/physical education electives (HSL).

Dance. Not available 1990–1991 academic year.

All students must complete the arts and sciences core curriculum (see page 2).

Minor in Theatre

All students minoring in theatre are required to complete the following courses (for 32 QH): DRA 1100, Introduction to Theatre Arts; DRA 1106, Theatre History 1; DRA 1107, Theatre History 2; DRA 1108, Theatre History 3; DRA 1150, Introduction to Acting; DRA 1180, Concepts of Direction; DRA 1200, Stagecraft; and DRA 1212, Introduction to Theatrical Design. Lab practice in technical theatre and performance, in conjunction with the course requirements, is a required part of the minor.

Boston-Bouvé College of Human Development Professions

Specimen Program in Athletic Training

Not all curriculum changes had received final approval at the time this book was published. A copy of the approved curriculum for this program is available in the dean's office, 100 Dockser Hall.

First Year (for students entering Fall 1990)

Quarter 1			Quarter 2			Quarter 3		
No.	Course	QH	No.	Course	QH	No.	Course	QH
BIO 1140	Animal Bio. 1	4	BIO 1141	Animal Bio. 2	4	CHM 1112	Gen. Chemistry	5
ENG 1110	Fresh. Eng. 1	4	CHM 1111	Chemistry 1	5	HSL 1254	First Aid	2
HSL 1133	Phys. Cond.	1	ENG 1111	Fresh. Eng. 2	4	MTH 1106	Fund. of Math	4
HSL 1281	Current Hlth. Issues	4	PSY 1111	Psychology 1	4	_____	Elective	3
INT 1100	Beg. Computer Use	4						

Specimen Program in Cardiovascular Health and Exercise

Not all curriculum changes had received final approval at the time this book was published. A copy of the approved curriculum for this program is available in the dean's office, 100 Dockser Hall.

First Year (for students entering Fall 1990)

Quarter 1			Quarter 2			Quarter 3		
No.	Course	QH	No.	Course	QH	No.	Course	QH
BIO 1140	Animal Bio. 1	4	BIO 1141	Animal Bio. 2	4	HSL 1101	Int. Swimming	1
ENG 1110	Fresh. Eng. 1	4	CHM 1111	Chemistry 1	5	HSL 1134	Aerobic Exerc.	1
HSL 1133	Phys. Cond.	1	ENG 1111	Fresh. Eng. 2	4	HSL 1254	First Aid	2
PSY 1111	Psychology 1	4	HSL 1132	Weight Trng.	1	HSL 1281	Curr. Hlth. Issues	4
_____	Soc. Sci. Elect.	4	_____	Elective	4	INT 1100	Beg. Computer Use	4

Specimen Program in Physical Education Teacher Preparation

As of October 1, 1994, candidates seeking provisional teacher certification at any grade level (N-12) in the Commonwealth of Massachusetts need to earn a bachelor's degree with a major in the liberal arts and sciences. Within five years from becoming provisionally certified, candidates must complete a master's degree in the appropriate teaching discipline to become fully certified in Massachusetts. Accordingly, in addition to extensive study in physical education, each student beginning the program in Fall 1990 must select a major within the College of Arts and Sciences.

First Year (for students entering Fall 1990)

Quarter 1			Quarter 2			Quarter 3		
No.	Course	QH	No.	Course	QH	No.	Course	QH
ENG 1110	Fresh. Eng. 1	4	HSL 1109	Gymnastics 1	1	HSL 1112	Gym	1
HSL 1101	Int. Swim.	1	HSL 1140	Basketball	1	HSL 1173	Track & Field	1
HSL 1133	Phys. Cond.	1	HSL 1254	First Aid	2	INT 1100	Beg. Computer Use	4
HSL 1255	Human Move.	3	_____	A & S Core and	12	_____	A & S Core and	12
_____	A & S Core and	8	_____	Electives		_____	Electives	
_____	Electives							

Physical Education Major Courses: Second through Fifth Years

No.	Course	QH	No.	Course	QH
HSL 1255	Human Movement	4	HSL _____	Theory/Method of	4
HSL 1258	Elementary School	3	_____	Coaching Sport or	
	Activities		HSL _____	Foundations of	4
HSL 1259	Secondary School	3	_____	Dance Education	
	Activities		HSL _____	Motor Development	4
HSL 1261	Anatomy &	4	_____	& Learning	
	Physiology 1		HSL _____	Sport & Dance	6
HSL 1463	Overview of	4	_____	Personal Performance	
	Disabilities		_____	(a course or	
HSL 1610	Anatomy &	4	_____	competency waiver	
	Physiology 2		_____	in thirteen specified	
HSL 1611	Kinesiology	4	_____	performance areas;	
HSL 1612	Exercise Physiology	4	_____	only 6 QH of these	
HSL 1615	Critical Teaching	4	_____	may be applied	
	Skills		_____	toward the graduation	
HSL 1802	Student Teaching 1	6	_____	QH minimum.)	
HSL 1803	Student Teaching 2	6	HSL _____	Electives	0-12

Specimen Program in Recreation Management

First Year

Quarter 1

No.	Course	QH
ED 1100	Soc. Sci.	4
ENG 1110	Fresh. Eng. 1	4
HSL 1220	Fdn. Ldship/Leisure Studies	4
SPC 1115	Comm. Skills	4

Second Year

Third Year

Fourth Year

Fifth Year

Quarter 2

No.	Course	QH
BIO 1140	Animal Bio. 1	4
ENG 1111	Fresh. Eng. 2	4
HSL 1223	Life Career Planning	4
INT 1100	Beg Computer Use	4

Quarter 4

No.	Course	QH
ED 1102	Human Dev. 1	4
HSL 1221	Int. Rec. & Les. Serv.	3
HSL 1261	Anat./Phys. 1	4
_____	Science Elective	4

Quarter 6*

No.	Course	QH
HSL 1408	Research Methods	4
HSL 1423	Comm. Rec. Mgmt.	3
HSL 1426	Budget Analysis	4
_____	Guided Elective	4

Quarter 8

No.	Course	QH
HSL 1400	Org. Behavior	3
HSL 1406	Internship Sem.	1
HSL 1446	El. Out. Rec. Pl.	4
HSL _____	Dept. Elective	3
_____	Guided Elective	4

Quarter 10

No.	Course	QH
HSL 1403	Concepts of Leisure	4
HSL 1422	Prog. Eval. in Rec.	4
HSL 1467	Soc. Psych. Impact of Illness	4
_____	Guided Elective	4

Quarter 3

No.	Course	QH
ED _____	Found. Ed.	4
HSL 1253	Group Dynamics	3
HSL 1281	Curr. Hlth. Issues	4
HSL _____	Prof. Skills	4
MTH 1106	Fund. of Math	4

Quarter 5

No.	Course	QH
ED 1103	Human Dev. 2	4
HSL 1610	Anat./Phys. 2	4
_____	Guided Elective	4
_____	Science Elective	4

Quarter 7

No.	Course	QH
HSL 1401	Program Planning	4
HSL 1409	Research App.	4
HSL _____	Dept. Elective	3
_____	Guided Electives	8

Quarter 9

No.	Course	QH
HSL 1800	Superv. Field Exp. 1	6
HSL 1801	Superv. Field Exp. 2	6

Quarter 11

No.	Course	QH
HSL 1410	Senior Seminar	4
HSL 1421	Adm. of Rec. & Parks	4
HSL _____	Ther. Rec. Elective	4
_____	Guided Elective	4

*Beginning with quarter 6, use one elective space to fulfill the middler year writing requirement.

173 QH = Minimum graduation requirement.

Specimen Program in Therapeutic Recreation

First Year

Quarter 1

No.	Course	QH
ED 1100	Soc. Sci.	4
ENG 1110	Fresh. Eng. 1	4
HSL 1220	Fn. Ldsp. Ls. Sv.	4
SPC 1115	Comm. Skills	3

Second Year

Third Year

Quarter 2

No.	Course	QH
BIO 1140	Animal Bio. 1	4
ENG 1111	Fresh. Eng. 2	4
HSL 1223	Life Career Planning	4
INT 1100	Beg Computer Use	4

Quarter 4

No.	Course	QH
ED 1102	Human Dev. 1	4
HSL 1221	Int. Rc. & Les. Serv.	3
HSL 1261	Anat./Phys. 1	4
_____	Science Elective	4

Quarter 6*

No.	Course	QH
HSL 1408	Research Methods	4
HSL 1463	Overview of Dis.	4
HSL 1464	Prog. Plan. T/R	4
_____	Guided Elective	4

Quarter 3

No.	Course	QH
ED _____	Found. Ed.	4
HSL 1253	Group Dynamics	3
HSL 1281	Curr. Hlth. Issues	4
HSL _____	Prof. Skills	4
MTH 1106	Fund. of Math	4

Quarter 5

No.	Course	QH
ED 1103	Human Dev. 2	4
HSL 1610	Anat./Phys. 2	4
_____	Guided Elective	4
_____	Science Elective	4

Quarter 7

No.	Course	QH
HSL 1401	Program Planning	4
HSL 1409	Research App.	4
_____	Guided Electives	8

Fourth Year**Quarter 8**

No.	Course	QH
HSL 1400	Org. Behavior	3
HSL 1406	Intnship. Sem.	1
HSL 1426	Budget Analysis	4
HSL 1466	Fdn. Psych. Serv.	4
	Guided Elective	4

Quarter 9

No.	Course	QH
HSL 1800	Superv. Field Exp. 1	6
HSL 1801	Superv. Field Exp. 2	6

Fifth Year**Quarter 10**

No.	Course	QH
HSL 1403	Concepts of Leisure	4
HSL 1467	Soc. & Psy. Imp.	4
	Guided Electives	8

Quarter 11

No.	Course	QH
HSL 1410	Senior Seminar	4
HSL 1421	Admin. of Rec. & Parks	4
HSL 1462	Leisure Couns.	4
	Guided Elective	4

*Beginning with quarter 6, use one elective space to fulfill the middler year writing requirement.

173 QH = Minimum graduation requirement.

Specimen Program in School and Community Health Education

As of October 1, 1994, candidates seeking provisional teacher certification at any grade level (N-12) in the Commonwealth of Massachusetts need to earn a bachelor's degree with a major in the liberal arts and sciences. Within five years from becoming provisionally certified, candidates must complete a master's degree in the appropriate teaching discipline to become fully certified to teach in Massachusetts. Accordingly, in addition to extensive study in health education, each student beginning the program in Fall 1990 must select a major within the College of Arts and Sciences.

Due to extensive curriculum changes mandated by the Commonwealth of Massachusetts' new requirements, not all curricula had received final approval at the time this book was published. A copy of the approved curriculum for the school and community health education program is available in the dean's office, 100 Dockser Hall.

First Year (for students entering Fall 1990)

Quarter 1

No.	Course	QH
	A & S Core and Electives	16

Quarter 2

No.	Course	QH
	A & S Core and Electives	16
HSL 1254	First Aid	2

Quarter 3

No.	Course	QH
	A & S Core and Electives	12
HSL 1101	Beg Computer Use	4

Second through Fifth Years

No.	Course	QH
BIO 1150	Anatomy & Physiology 1	4
BIO 1151	Anatomy & Physiology 2	4
HSL —	Foundations of Health Education	4
HSL —	Epidemiology & Disease Prevention	4
HSL 1254	First Aid & CPR	2
HSL 1285	Health Concerns of Youth	4
HSL 1286	Nutrition	4

No.	Course	QH
HSL 1500	Mental Health	4
HSL 1503	Human Sexuality & Family	4
HSL 1506	Community Health	4
HSL 1508	Senior Seminar	2
HSL 1510	Health Counseling	4
HSL 1516	Drug Use/Abuse	4
HSL 1585	Teaching Procedures	4
HSL 1802	Student Teaching	6
HSL 1803	Student Teaching	6
HSL —	Electives	0-8

Specimen Program in Physical Therapy

First Year**Quarter 1**

No.	Course	QH
CHM 1111	Gen. Chemistry 1	5
MTH 1106	Fund. of Math.	4
PSY 1111	Fnd. of Psych. 1	4

Quarter 2

No.	Course	QH
BIO 1152	Anat. & Phys. 1	4
CHM 1112	Gen. Chemistry 2	4
ENG 1110	Fresh. Eng. 1	4

Quarter 3

No.	Course	QH
BIO 1153	Anat. & Phys. 2	4
ENG 1111	Fresh. Eng. 2	4
MTH 1107	Func. & Basic Calculus	4

Quarter 1, 2, or 3

No.	Course	QH
HSL 1254	First Aid	2
HSL 1281	Curr. Hlth. Issues	4
INT 1100	Beginning Computer Use	4
PTH 1114	In. Phys. Thpy. 1	2

Second Year**Quarter 4**

No.	Course	QH
BIO 1154	Anat. & Phys. 3	4
PHY 1201	Phys. Life Sci. 1	4
PHY 1501	Phys. Lab L.S. 1	1
PTH 1114	Intro. Phys. Thrpy. 1 (transfers only)	2
PTH 1118	Dev. Basis Human Perform.	4
_____	Elective*	4

Quarter 5

No.	Course	QH
PHY 1202	Phys. Life Sci. 2	4
PSY 1112	Fnd. Psych. 2	4
PTH 1115	Intro. Phys. Thrpy. 2	2
_____	Elective*	4
_____	Elective*	4

Third Year**Quarter 6**

No.	Course	QH
PTH 1310	Clin. Gross Anat.	6
PTH 1315	Physiology for P.Ts.	5
PTH 1320	Phys. Thrpy. 1	2
PTH 1325	Clin. Medicine 1	4

Quarter 7

No.	Course	QH
ENG 1340	Writing Workshop	1
PTH 1330	Clin. Kinesiology	5
PTH 1335	Phys. Thrpy. 2	3
PTH 1340	Phys. Thrpy. 3	4
PTH 1345	Clin. Medicine 2	3
PTH 1352	Psych. Asp. of Ill.	3

Fourth Year**Quarter 8**

No.	Course	QH
PTH 1355	Phys. Thrpy. 4	3
PTH 1360	Phys. Thrpy. 5	4
PTH 1366	Neuroanatomy	5
PTH 1370	Clin. Seminar	2

Quarter 9

No.	Course	QH
PTH 1375	Phys. Thrpy. 7	2
PTH 1380	Superv. Clin. Ed. 1	5
PTH 1385	Clin. Medicine 3	3
PTH 1390	Phys. Thrpy. 6	3
PTH 1395	Phys. Thrpy. 5 cont.	1

Fifth Year**Quarter 10**

No.	Course	QH
PTH 1400	Admin.	4
PTH 1405	Res. Phys. Thrpy.	4
PTH 1411	Phys. Thrpy. 8	4
_____	Elective	4
_____	Elective	4

Quarter 11

No.	Course	QH
PTH 1415	Superv. Clin. Ed. 2	0

In quarters 10 and 11 the class is divided in half, with half of the class on campus and half in Supervised Clinical Education 2 for one quarter each.

*One elective must be selected from each of three academic areas: philosophy, fine arts, and political science or history.

Specimen Program in Human Services

Quarter 1

ED 1100, Education and Social Science, or SOC 1100, Introduction to Sociology; ENG 1110, Freshman English 1; POL 1111, Introduction to American Government, or another approved political science course; college distribution requirement.

Quarter 2

ED 1302, Introduction to Human Services Professions; ED 1102, Human Development 1 or PSY 1111, Foundations of Psychology 1; ENG 1111, Freshman English 2; and a social and communities issues course.

Quarter 3

ED 1103, Human Development 2, or PSY 1112, Foundations of Psychology 2; ECN 1116, Principles of Microeconomics, or another approved economics course; college distribution requirement; and a computer literacy course.

Bachelor of Science

Prerequisite courses. ED 1100, Education and Social Science, or SOC 1100, Introduction to Sociology; ED 1302, Introduction to Human Services Professions; ED 1102, Human Development 1, or PSY 1111, Foundations of Psychology 1; ED 1103 Human Development 2, or PSY 1112, Foundations of Psychology 2;

POL 1111, Introduction to American Government, or another approved political science course; and ECN 1116, Principles of Microeconomics, or another approved economics course.

Core courses. ED 1307, Introduction to Educational Statistics, or SOC 1320, Introduction to Statistical Analysis, or PSY 1211, Statistics in Behavioral Science 1; SOC 1324, Human Services Research and Evaluation, or PSY 1511, Experimental Design in Psychology, or SOC 1321, Research Methods 1; SOC 1240, Sociology of Human Services Organizations; PSY 1272, Personality 1; PSY 1373, Abnormal Psychology 1; ED 1300, Education and Psychosocial Development; ED 1317, Seminar on Group Process, or SPC 1330, Interpersonal Communication 1, or SPC 1338, Group Discussion; CRS 1310, Intervention Strategies; and INT 1333, Senior Seminar in Human Services.

Social and community issues courses. Three courses focused on subjects such as poverty and welfare, minority affairs, special needs populations, and other contemporary American social problems, chosen with the student's academic adviser.

Human service fieldwork. INT 1330, Field Experience in Human Services 1; INT 1331, Field Experience in Human Services 2. **Human services specializations.** Five courses in a particular subfield of human services, chosen with the student's academic adviser. Alternatives are grouped in three clusters: clinical, community, and administration.

University and college requirements. Computer literacy requirement; Freshman English 1 and 2; Middler Year Writing Requirement; distribution requirements of four math/science and four humanities courses; eleven Boston-Bouv  College courses taken among those normally required to complete degree requirements.

Specialization in Deaf Studies

Prerequisite, core, and fieldwork courses follow the standard human services major.

Three social and community issues courses, selected from the subjects suggested above, and/or from the following. PSY1271, Social Psychology, or SOC1135, Social Psychology; SOA1135 Language and Culture; SOA1101, Culture, Meaning, and Everyday Experience; ENG1118, Introduction to Language; PSY1263,

Body Language; SOC1140, Sociology of Prejudice; SPC1232, Male and Female Communication; CRS1314, Introduction to Counseling. *Deaf studies specialization.* ASL 1101, American Sign Language 1; ASL 1102, American Sign Language 2; ASL 1201, Intermediate American Sign Language 1; ASL 1202, Intermediate American Sign Language 2; and one to five courses selected from: ASL 1211, Deaf Culture; ASL 1212, Deaf History; PSY 1363, American Sign Language Linguistics; PSY 1261, Bilingualism; SLA 1101, Introduction to Speech and Hearing; and ASL 1401, American Sign Language Literature.

176 QH = Minimum graduation requirement.

Education Programs

Early Childhood Education Elementary Education and High School Teacher Certification

General requirements.

1. Effective October 1, 1994, all students seeking teaching certificates in Massachusetts at any grade level (K-12) will need a degree that consists of both a major in the arts and sciences and a program of study in education. Arts and sciences majors are available only in the College of Arts and Sciences; programs in education are available through the Boston-Bouv  College of Human Development Professions.

2. Students who wish to obtain certification as an early childhood education teacher or an elementary education teacher should enroll in the Boston-Bouv  College dual-major program. These students will be assigned advisers from both Boston-Bouv  and the College of Arts and Sciences. Advisers help the student plan an appropriate education/arts and sciences dual major. The dual major includes a major in education, a major in the arts and sciences, and distribution requirements. Specimen dual major programs are available in 54 Lake Hall.

3. Students who wish to obtain high school teacher certification should enroll in the College of Arts and Sciences and select an appropriate major. Students should also select a minor in education. The requirements of the education minor can be obtained in 54 Lake Hall.

College of Business Administration

Specimen Program for First Three Quarters

The courses taken in the first three quarters are the same for all concentrations.

Quarter 1

No.	Course	QH
ECN 1105	Econ. Princ.	4
ENG 1110	Fresh. Eng. 1	4
MTH 1113	Math for Bus. or	4
MTH 1114	Calculus for Bus.	4
	A & S Electives	8

Quarter 2

No.	Course	QH
ECN 1106	Econ. Prin.	4
MTH 1113	Math for Bus. or	4
MTH 1114	Calculus for Bus.	4
	A & S Electives	8

Quarter 3

No.	Course	QH
ENG 1111	Fresh. Eng. 2	4
MGT 1115	Intro. Bus.	4
	A & S Electives	8

During the five-year program at least one elective must be taken from the approved international elective list.

Accounting

Quarter 4	ACC 1111, Accounting Principles 1; MSC 1200, Business Statistics 1; MSC 1226, Introduction to Data Processing; and one nonbusiness elective.
Quarter 5	ACC 1112, Accounting Principles 2; MSC 1201, Business Statistics 2; and two nonbusiness electives.
Quarter 6	ACC 1331, Intermediate Accounting 1; FIN 1438, Principles of Finance 1; and HRM 1433, Organizational Behavior and Design.
Quarter 7	ACC 1332, Intermediate Accounting 2; ACC 1339, Cost Accounting 1; FIN 1439, Principles of Finance 2; and MKT 1435, Introduction to Marketing.
Quarter 8	ACC 1343, Intermediate Accounting 3; ACC 1345, Accounting Systems; MSC 1441, Operations Management; and one nonbusiness elective.
Quarter 9	ACC 1347, Auditing; MSC 1433, Quantitative Models in Business; MGT 1446, Managing Social Issues; and upper division writing requirement.
Quarter 10	ACC 1351, Federal Income Tax 1; MGT 1450, Business Policy; and two open electives.
Quarter 11	Three open electives; and a nonbusiness elective.

Entrepreneurship and New Venture Management

Quarter 4	ACC 1111, Accounting Principles 1; MSC 1200, Business Statistics 1; MSC 1226, Introduction to Data Processing; and one nonbusiness elective.
Quarter 5	ACC 1112, Accounting Principles 2; MSC 1201, Business Statistics 2; and two nonbusiness electives.
Quarter 6	ENT 1330, Management of Smaller Enterprises; FIN 1438, Principles of Finance 1; MKT 1435, Introduction to Marketing; and an open elective.
Quarter 7	FIN 1439, Principles of Finance 2; HRM 1433, Organizational Behavior and Design; and MSC 1433, Quantitative Models in Business.
Quarter 8	ENT 1344, Opportunity Analysis and Venture Capital; a nonbusiness elective; an open elective; and upper division writing requirement.
Quarter 9	FIN 1770, Small Business Finance; MGT 1446, Managing Social Issues; MSC 1441, Operations Management; and an open elective.
Quarter 10	MGT 1450, Business Policy; ENT 1352, New Venture Creation; a nonbusiness elective; and an open elective.
Quarter 11	ENT 1358, Small Business Institute Field Project; and two open electives.

Finance and Insurance

Quarter 4	ACC 1111, Accounting Principles 1; MSC 1200, Business Statistics 1; and two nonbusiness electives.
Quarter 5	ACC 1112, Accounting Principles 2; MSC 1201, Business Statistics 2; MSC 1226, Introduction to Data Processing; and a nonbusiness elective.
Quarter 6	FIN 1438, Introduction to Finance; FIN 1333, Financial Institutions and Markets; MKT 1435, Introduction to Marketing; and a nonbusiness elective.
Quarter 7	FIN 1439, Principles of Finance 2; HRM 1433, Organizational Behavior and Design; and MSC 1433, Quantitative Models in Business.
Quarter 8	FIN 1335, Managerial Finance; FIN 1346, Investment Management; upper division writing requirement; and an open elective.
Quarter 9	MSC 1441, Operations Management; MGT 1446, Managing Social Issues; Finance elective; and an open elective.
Quarter 10	MGT 1450, Business Policy; Finance elective; and two open electives.
Quarter 11	Finance elective; and three open electives.

Human Resources Management

Quarter 4	ACC 1111, Accounting Principles 1; MSC 1200, Business Statistics 1; MSC 1226, Introduction to Data Processing; and one nonbusiness elective.
Quarter 5	ACC 1112, Accounting Principles 2; MSC 1201, Business Statistics 2; and three nonbusiness electives.
Quarter 6	FIN 1438, Principles of Finance 1; HRM 1433, Organizational Behavior and Design; and MSC 1433, Quantitative Models in Business.
Quarter 7	FIN 1439, Principles of Finance 2; HRM 1332, Introduction to Human Resource Management; MKT 1435, Introduction to Marketing; and an open elective.
Quarter 8	HRM 1348, Reward Systems; HRM 1349, Assessment of Prospective Employees; MSC 1441, Operations Management; and an open elective.
Quarter 9	MGT 1446, Managing Social Issues; Human Resources Management elective; upper division writing requirement; and an open elective.
Quarter 10	HRM 1345, Contemporary Labor Issues; MGT 1450, Business Policy; Human Resources Management elective; and an open elective.
Quarter 11	Nonbusiness elective; and three open electives.

International Business Administration

Quarter 4	ACC 1111, Accounting Principles 1; MSC 1200, Business Statistics 1; and two nonbusiness electives.
Quarter 5	ACC 1112, Accounting Principles 2; MSC 1201, Business Statistics 2; MSC 1226, Introduction to Data Processing; and two nonbusiness electives.
Quarter 6	FIN 1438, Introduction to Finance; HRM 1433, Organizational Behavior and Design; and INB 1338, Introduction to International Business.
Quarter 7	FIN 1439, Principles of Finance 2; FIN 1759, International Financial Markets; MKT 1435, Introduction to Marketing; and MSC 1433, Quantitative Models in Business.
Quarter 8	MSC 1441, Operations Management; a business elective; an international nonbusiness elective; and an open elective.
Quarter 9	MGT 1446, Managing Social Issues; upper division writing requirement; an international business elective; and an open elective.
Quarter 10	MGT 1450, Business Policy; an international nonbusiness elective; and two open electives.
Quarter 11	INB 1352; Seminar in International Business; an international business elective; and two open electives.

Management

Quarter 4	ACC 1111, Accounting Principles 1; MSC 1200, Business Statistics 1; and two nonbusiness electives.
Quarter 5	ACC 1112, Accounting Principles 2; MSC 1201, Business Statistics 2; MSC 1226, Introduction to Data Processing; and a nonbusiness elective.
Quarter 6	FIN 1438, Introduction to Finance; HRM 1433, Organizational Behavior and Design; and MSC 1433, Quantitative Models in Business.
Quarter 7	ACC 1330, Cost Accounting; FIN 1439, Principles of Finance 2; HRM 1332, Introduction to Human Resource Management; and MKT 1435, Introduction to Marketing.
Quarter 8	MGT 1345, Legal Aspects of Business; MSC 1441, Operations Management; a business elective; and an open elective.
Quarter 9	MGT 1446, Managing Social Issues; a business elective; an open elective; and upper division writing requirement.
Quarter 10	MGT 1450, Business Policy; a nonbusiness elective; and two open electives.
Quarter 11	Business elective; and three open electives.

Management Information Systems

Quarter 4	ACC 1111, Accounting Principles 1; MSC 1200, Business Statistics 1; and two nonbusiness electives.
Quarter 5	ACC 1112, Accounting Principles 2; MSC 1201, Business Statistics 2; MSC 1226, Introduction to Data Processing; and a nonbusiness elective.
Quarter 6	FIN 1438, Introduction to Finance; HRM 1433, Organizational Behavior and Design; and MSC 1331, End User Computing.
Quarter 7	FIN 1439, Principles of Finance 2; MKT 1435, Introduction to Marketing; MSC 1339, COBOL Programming; and MSC 1433, Business Modeling.
Quarter 8	MSC 1441, Operations Management; MSC 1340, Advanced COBOL; a nonbusiness elective; and an open elective.
Quarter 9	MGT 1446, Managing Social Issues; MSC 1349, Systems Analysis and Design; upper division writing requirement; and a nonbusiness elective.
Quarter 10	MGT 1450, Business Policy; MSC 1350, Database Management Systems; and two open electives.
Quarter 11	MSC 1351, Management Information Systems; and three open electives.

Marketing

Quarter 4	ACC 1111, Accounting Principles 1; MSC 1200, Business Statistics 1; MSC 1226, Introduction to Data Processing; and a nonbusiness elective.
Quarter 5	ACC 1112, Accounting Principles 2; MSC 1201, Business Statistics 2; and two nonbusiness electives.
Quarter 6	FIN 1438, Principles of Finance 1; MKT 1435, Introduction to Marketing; MSC 1433, Quantitative Models in Business; and an open elective.
Quarter 7	FIN 1439, Principles of Finance 2; HRM 1433, Organizational Behavior and Design; and MKT 1331, Marketing Management.
Quarter 8	MKT 1341, Marketing Research; a marketing elective; an open elective; and upper division writing requirement.
Quarter 9	MGT 1446, Managing Social Issues; MSC 1441, Operations Management; a marketing elective; and an open elective.
Quarter 10	MKT 1351, Competitive Strategies; MGT 1450, Business Policy; and two open electives.
Quarter 11	Marketing elective; and three open electives.

Transportation and Logistics Management

Quarter 4	ACC 1111, Accounting Principles 1; MSC 1200, Business Statistics 1; and two nonbusiness electives.
Quarter 5	ACC 1112, Accounting Principles 2; MSC 1201, Business Statistics 2; MSC 1226, Introduction to Data Processing; and a nonbusiness elective.
Quarter 6	FIN 1438, Introduction to Finance; HRM 1433, Organizational Behavior and Design; and TRN 1333, The Domestic Transportation System.
Quarter 7	FIN 1439, Principles of Finance 2; a transportation elective; MKT 1435, Introduction to Marketing; and MSC 1433, Quantitative Models in Business.
Quarter 8	MSC 1441, Operations Management; a transportation elective; a nonbusiness elective; and an open elective.
Quarter 9	MGT 1446, Managing Social Issues; TRN 1344, Corporate Transportation/Logistics; an open elective; and upper division writing requirement.
Quarter 10	MGT 1450, Business Policy; a transportation elective; and two open electives.
Quarter 11	TRN 1353, Seminar in Transportation and Logistics; and three open electives.

College of Computer Science

Specimen Program for the Five-Year Computer Science BS Program

First Year

Quarter 1

No.	Course	QH
COM 1100	Fund of CS	4
COM 1121	CS Overview 1	1
ENG 1110	Fresh. Eng. 1	4
MTH 1123	Calculus 1	4
_____	Basic Soc Sci elect. 2	4

Second Year

Quarter 2

No.	Course	QH
COM 1101	Alg. & Data Str 1	4
COM 1122	CS Overview 2	1
MTH 1124	Calculus 2	4
MTH 1137	Discr. Math 1	4
_____	Basic Soc Sci elect. 2	4

Quarter 3

No.	Course	QH
COM 1110	FORTTRAN Lab	1
COM 1201	Alg. & Data Str. 2	4
ENG 1111	Fresh. Eng. 2	4
MTH 1125	Calculus 3	4
_____	Subarea or general elect. 1	4

Quarter 4

No.	Course	QH
COM 1130	Comp Org & Prog 1	4
MTH 1223	Calculus 4	4
PHY 1231	Physics 1	4
PHY 1521	Phys Lab 1	1
_____	Subarea or general elect. 2	4

Quarter 5

No.	Course	QH
COM 1114	C. Lab.	1
COM 1131	Comp Org & Prog 2	4
MTH 1237	Discr. Math 2	4
PHY 1232	Physics 2	4
PHY 1522	Phys. Lab. 2	1
_____	Subarea or general elect. 3	4

Third Year

Quarter 6

No.	Course	QH
COM 1330	Systems Prog.*	4
ECE 1229	Digital Sys. Lab	1
ECE 1382	Computer Engr.	4
PHY 1233	Physics 3	4
_____	Subarea or general elect. 4	4

Quarter 7

No.	Course	QH
COM 1102	Func. Prog. & Appl.	4
COM 1350	Automata & Formal Lang.*	4
ENG 1125	Tech. Writing	4
_____	Subarea or general elect. 5	4

Fourth Year

Quarter 8

No.	Course	QH
COM 1310	File Structures*	4
MTH 1301	Linear Algebra	4
SOC 1485	Computers & Soc.	4
_____	Comp. Sci. Elect. 1	4

Quarter 9

No.	Course	QH
COM 1205	Software Des.*	4
MTH 1387	Probability	4
_____	Comp. Sci. Elect. 2	4
_____	Subarea or general elect. 6	4

Fifth Year

Quarter 10

No.	Course	QH
_____	Comp. Sci. Elect. 3	4
_____	Comp. Sci. Elect. 4	4
_____	Subarea or general elect. 7	4
_____	Subarea or general elect. 8	4

Quarter 11

No.	Course	QH
COM 1621	Senior Seminar	1
_____	Comp. Sci. Elect. 5	4
_____	Subarea or general elect. 9	4
_____	Subarea or general elect. 10	4
_____	Subarea or general elect. 11	4

*COM 1330 in quarter 6 may be switched with COM 1310 in quarter 8. COM 1350 in quarter 7 may be switched with COM 1205 in quarter 9.

Specimen Program for the Four-Year Computer Science BS Program

First Year

Quarter 1

No.	Course	QH
COM 1100	Fund of CS	4
COM 1121	CS Overview 1	1
ENG 1110	Fresh. Eng. 1	4
MTH 1123	Calculus 1	4
_____	Basic Soc. Sci. 1	4

Quarter 2

No.	Course	QH
COM 1101	Alg. & Data Str. 1	4
COM 1122	CS Overview 2	1
MTH 1124	Calculus 2	4
MTH 1137	Discr. Math 1	4
_____	Basic Soc. Sci. 2	4

Quarter 3

No.	Course	QH
COM 1110	FORTTRAN Lab	1
COM 1201	Alg. & Data Str. 2	4
ENG 1111	Fresh. Eng. 2	4
MTH 1125	Calculus 3	4
_____	Subarea or gen'l elect. 1	4

Second Year

Quarter 4

No.	Course	QH
COM 1130	Comp Org 1	4
MTH 1223	Calculus 4	4
PHY 1231	Physics 1	4
PHY 1521	Phys. Lab 1	1
_____	Subarea or gen'l elect. 2	4

Quarter 5

No.	Course	QH
COM 1131	Comp Org. & Prog. 2	4
MTH 1237	Discr. Math 2	4
PHY 1232	Physics 2	4
PHY 1522	Phys. Lab 2	1
_____	Subarea or gen'l elect. 3	4

Third Year

Quarter 6

No.	Course	QH
COM 1114	C. Lab.	1
COM 1350	Automata & Formal Lang.	4
MTH 1387	Probability	4
_____	Subarea or gen'l elect. 4	4
_____	Subarea or gen'l elect. 5	4

Quarter 7

No.	Course	QH
COM 1330	Systems Prog.*	4
ECE 1382	Computer Eng.	4
ECE 1229	Digital Sys. Lab	1
PHY 1233	Physics 3	4
_____	Subarea or gen'l elect. 6	4

Fourth Year

Quarter 8

No.	Course	QH
COM 1102	Func. Prog. & Appl.	4
ENG 1125	Tech. Writing	4
_____	Comp. Sci. Elect. 1	4
_____	Subarea or gen'l elect. 7	4

Quarter 9

No.	Course	QH
COM 1205	Software Design	4
MTH 1301	Linear Algebra	4
_____	Comp. Sci. Elect. 2	4
_____	Subarea or gen'l elect. 8	4

Fifth Year

Quarter 10

No.	Course	QH
COM 1310	File Structures*	4
SOC 1485	Computers & Soc.	4
_____	Comp. Sci. Elect. 3	4
_____	Subarea or gen'l elect. 9	4

Quarter 11

No.	Course	QH
COM 1621	Senior Seminar	1
_____	Comp. Sci. Elect. 4	4
_____	Comp. Sci. Elect. 5	4
_____	Subarea or gen'l elect. 10	4
_____	Subarea or gen'l elect. 11	4

*COM 1330 in quarter 7 may be switched with COM 1310 in quarter 10.

Note: The co-op assignments for this four-year program are as follows.

Six month: Summer and fall quarters following freshman year.

Three month: Winter of junior year.

Three month: Winter of senior year.

Computer Science Major Requirements

Computer Science

Level 1

No.	Course	QH
COM 1100	Fund. Comp. Sci.	4
COM 1101	Alg. & Data Str. 1	4
COM 1102	Funct. Prog. & Appl.	4
COM 1110	FORTRAN Lab	1
COM 1114	C Lang. Lab	1
COM 1121	CS Overview 1	1
COM 1122	CS Overview 2	1
COM 1130	Comp Org & Prog 1	4
COM 1131	Comp Org & Prog 2	4
COM 1201	Alg. & Data Str. 2	4
COM 1205	Software Design	

Level 2 (select eight courses, including the first course in each track and at least one complete track)

No.	Course	QH
Database Track		
COM 1310	File Structures	4
COM 1315	Database Mgmt. 1	4
COM 1316	Database Mgmt. 2	4

Systems Track

COM 1330	Systems Prog.	4
COM 1335	Operating Systems 1	4
COM 1336	Operating Systems 2	4

Languages Track

COM 1350	Automata & Form. Lan.	4
COM 1355	Compiler Design 1	4
COM 1356	Compiler Design 2	4

Electives

COM 1358	Anal. of Prog. Lang.	4
COM 1370	Computer Graphics	4
COM 1390	Anlys. of Algorithms	4
COM 1410	Artificl. Intelligence	4
COM 1800	Directed Study in CS	4

Seminar (To be taken during senior year)

COM 1621	Computer Sci. Sem.	1
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Mathematics

Level 1

No.	Course	QH
MTH 1231	Calculus 1	4
MTH 1232	Calculus 2	4
MTH 1233	Calculus 3	4
MTH 1137	Discrete Math. 1	4
MTH 1223	Calculus 4	4
MTH 1237	Discrete Math. 2	4

Level 2

No.	Course	QH
MTH 1301	Linear Algebra	4
MTH 1387	Probability	4

Physics

Level 2

No.	Course	QH
PHY 1231	Physics 1	4
PHY 1232	Physics 2	4
PHY 1233	Physics 3	4
PHY 1521	Physics Lab 1	1
PHY 1522	Physics Lab 2	1

Electrical Engineering

Level 2

No.	Course	QH
ECE 1382	Computer Engr.	4
ECE 1229	Digital Sys. Lab	1

English

Level 1

No.	Course	QH
ENG 1110	Freshman Eng. 1	4
ENG 1111	Freshman Eng. 2	4

Level 2

No.	Course	QH
ENG 1125	Technical Writing	4

Social Science

Level 1

No.	Course	QH
HST 1101	Western Civ. 1	4
HST 1102	Western Civ. 2	4
HST 1201	U.S. to 1877	4
HST 1202	U.S. since 1877	4
POL 1111	American Gov.	4
POL 1112	Intl. Relations	4
SOA 1104	Cultures of the World	4
SOC 1121	Doing Sociology	4

Level 2

No.	Course	QH
SOC 1485	Computers & Soc.	4

Other Subject Areas

Subarea Electives (5)	20 QH
General Electives (6)	24 QH

Computer Science Requirements
Requirements for Computer
Science Majors

Computer Science Courses

Computer Science courses fall into two levels. Level 1 consists of courses COM 1100, COM 1101, COM 1201, COM 1130, COM 1131, COM 1102, and COM 1205; labs COM 1110 and COM 1114; and overview courses COM 1121 and COM 1122. All other computer science courses are Level Two.

The Level 1 courses are all required.

Eight Level 2 courses must be taken, including the first course in each track and at least once complete track. The tracks are as follows:

- Database: COM 1310, COM 1315, COM 1316
Systems: COM 1330, COM 1335, COM 1336
Languages: COM 1350, COM 1355, COM 1356

Mathematics Courses

Majors must take the following eight mathematics courses: Level 1 Calculus MTH 1123, MTH 1124, MTH 1125, and MTH 1223; Discrete Mathematics MTH 1137, MTH 1237; Level 2 Probability MTH 1387; and Linear Algebra MTH 1301.

Physics Courses

Majors must take the following three courses: Physics PHY 1231, PHY 1232, and PHY 1233; and two labs: PHY 1521 and PHY 1522.

Electrical Engineering Courses

Majors must take the following two electrical engineering courses: ECE 1229, Digital Systems Lab and ECE 1382, Computer Engineering.

Other Subject Areas

Majors must take the following four courses: English ENG 1110 and ENG 1111; Technical Writing ENG 1125; Computers and Society SOC 1485. In addition, majors must take two basic social science courses which must be chosen from the following pairs: HST 1101 and HST 1102, *or* HST 1201 and HST 1202, *or* POL 1111 and POL 1112, *or* SOA 1104 and SOA 1121.

Majors must take at least five courses that form a subarea. The College of Computer Science will provide lists of suitable courses in a variety of subareas.

Majors have six free electives. However, at least two courses among the total eleven (five in the subarea and six general electives) must be in social sciences or humanities.

Requirements for Computer
Science Minors

In addition to fulfilling the requirements of their major department, students who wish to minor in computer science must take the following four courses: COM 1100, COM 1101, COM 1130, COM 1201. They must also take three additional 4 QH courses with the COM prefix from those listed on this page.

Specimen Program for the Five-Year Computer Science BA Program

This curriculum applies to the classes of 1994 and 1995 with computer science courses starting in the first year.

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	QH	No.	Course	QH	No.	Course	QH
COM 1100	Fund. of CS	4	COM 1101	Alg. & Data Str 1	4	COM 1201	Alg. & Data Str 2	4
COM 1121	CS Overview 1	1	COM 1122	CS Overview 2	1	ENG 1111	Fresh. Eng. 2	4
ENG 1110	Fresh. Eng. 1	4	MTH 1124	Calculus 2	4	MTH 1125	Calculus 3	4
MTH 1123	Calculus 1	4	MTH 1137	Discrete Math 1	4	_____	Gen. elective 1	4
_____	A & S Core 1	4	_____	A & S Core 2	4			

Second Year

Quarter 4			Quarter 5		
No.	Course	QH	No.	Course	QH
COM 1130	Comp Org. & Prog. 1	4	COM 1102	Func. Prog. & Appl.	4
_____	Gen. elective 2	4	COM 1114	C Lab	1
_____	Science 1	4	COM 1350	Auto. & Frml. Lang.	4
_____	A & S Core 3	4	MTH 1237	Discrete Math 2	4
			_____	Science 2	4

Third Year

Quarter 6			Quarter 7		
No.	Course	QH	No.	Course	QH
COM 1390	Anal. Algorithms	4	COM 1358	Anal. Prog. Lang.	4
_____	Gen. elective 2	4	ENG _____	MYWR*	4
_____	Science 3	4	_____	A & S Core 5	4
_____	A & S Core 4	4	_____	A & S Core 6	4

Note: *MYWR is your middler year writing requirement course.

Fourth Year**Quarter 8**

No.	Course	QH
MTH 1301	Linear Algebra	4
SOC 1485	Computers & Soc. (Core 7)	4
_____	CS elective 1	4
_____	A & S Core 8	4

Quarter 9

No.	Course	QH
_____	CS elective 2	4
_____	Gen. elective 4	4
_____	A & S Core 9	4
_____	A & S Core 10	4

Fifth Year**Quarter 10**

No.	Course	QH
_____	CS elective 3	4
_____	Gen. elective 5	4
_____	Gen. elective 6	4
_____	A & S Core 11	4

Quarter 11

No.	Course	QH
COM 1621	Senior Seminar	1
_____	CS elective 4	4
_____	Gen. elective 7	4
_____	Gen. elective 8	4
_____	A & S Core 12	4

Specimen Program for the Five-Year Computer Science BA Program

This curriculum applies to the classes of 1994 and 1995 with computer science courses starting in the second year.

First Year**Quarter 1**

No.	Course	QH
ENG 1110	Fresh. Eng. 1	4
MTH 1123	Calculus 1	4
_____	Science 1	4
_____	A & S Core 1	4

Quarter 2

No.	Course	QH
MTH 1124	Calculus 2	4
_____	Gen. elective 1	4
_____	Science 2	4
_____	A & S Core 2	4

Quarter 3

No.	Course	QH
ENG 1111	Fresh. Eng. 2	4
MTH 1125	Calculus 3	4
_____	Gen. elective 1	4
_____	Science 3	4

Second Year**Quarter 4**

No.	Course	QH
COM 1100	Fund. of CS	4
COM 1121	CS Overview 1	1
MTH 1137	Discrete Math 1	4
_____	A & S Core 3	4
_____	A & S Core 4	4

Quarter 5

No.	Course	QH
COM 1101	Alg. & Data Str. 1	4
COM 1222	CS Overview 2	1
MTH 1237	Discrete Math 2	4
_____	A & S Core 5	4
_____	A & S Core 6	4

Third Year**Quarter 6**

No.	Course	QH
COM 1201	Alg. & Data Str. 2	4
COM 1130	Computer Org. 1	4
_____	Gen. elective 2	4
_____	A & S Core 7	4

Quarter 7

No.	Course	QH
COM 1102	Func. Prog. & Appl.	4
COM 1114	C Lab	1
COM 1350	Auto. & Frml. Lang	4
ENG _____	MYWR*	4
_____	A & S Core 8	4

Fourth Year**Quarter 8**

No.	Course	QH
COM 1390	Anal. Algorithms	4
MTH 1301	Linear Algebra	4
SOC 1485	Computers & Soc. (Core 9)	4
_____	Gen. elective 4	4

Quarter 9

No.	Course	QH
COM 1358	Anal. Prog. Lang.	4
_____	CS elective 1	4
_____	Gen. elective 5	4
_____	A & S Core 10	4

Fifth Year**Quarter 10**

No.	Course	QH
_____	CS elective 2	4
_____	CS elective 3	4
_____	Gen. elective 6	4
_____	A & S Core 11	4

Quarter 11

No.	Course	QH
COM 1621	Senior Seminar	1
_____	CS elective 4	4
_____	Gen. elective 7	4
_____	Gen. elective 8	4
_____	A & S Core 12	4

Note: *MYWR is your middler year writing requirement course.

Specimen Program for the Four-Year Computer Science BA Program

This curriculum applies to the classes of 1993 and 1994.

First Year

Quarter 1

No.	Course	QH
COM 1100	Fund. of CS	4
COM 1121	CS Overview 1	1
ENG 1110	Fresh. Eng. 1	4
MTH 1123	Calculus 1	4
_____	A & S Core 1	4

Quarter 2

No.	Course	QH
COM 1101	Alg. & Data Str. 1	4
COM 1122	CS Overview 2	1
MTH 1124	Calculus 2	4
MTH 1137	Discrete Math 1	4
_____	A & S Core 2	4

Quarter 3

No.	Course	QH
COM 1201	Alg. & Data Str. 2	4
ENG 1111	Fresh. Eng. 2	4
MTH 1125	Calculus 3	4
_____	Gen. elective 1	4

Second Year

Quarter 4

No.	Course	QH
COM 1130	Comp. Org. & Prog. 1	4
_____	Science 1	4
_____	A & S Core 3	4
_____	A & S Core 4	4

Quarter 5

No.	Course	QH
COM 1102	Func. Prog. & Appl.	4
COM 1114	C Lab	1
COM 1350	Auto. & Frml. Lang.	4
MTH 1237	Discrete Math 2	4
_____	Science 2	4

Quarter 6

No.	Course	QH
COM 1390	Anal. Algorithms	4
_____	Gen. elective 2	4
_____	A & S Core 5	4
_____	A & S Core 6	4

Third Year

Quarter 7

No.	Course	QH
COM 1358	Anal. Prog. Lang.	4
MTH 1301	Linear Algebra	4
SOC 1485	Computers & Soc.	4
_____	(Core 7)	
_____	Science 3	4

Quarter 8

No.	Course	QH
_____	CS elective 1	4
ENG _____	MYWR*	4
_____	Gen. elective 3	4
_____	A & S Core 8	4

Quarter 9

No.	Course	QH
_____	CS elective 2	4
_____	Gen. elective 4	4
_____	A & S Core 9	4
_____	A & S Core 10	4

Fourth Year

Quarter 10

No.	Course	QH
_____	CS elective 3	4
_____	Gen. elective 5	4
_____	Gen. elective 6	4
_____	A & S Core 11	4

Quarter 11

No.	Course	QH
_____	Senior Seminar	1
_____	CS elective 4	4
_____	Gen. elective 7	4
_____	Gen. elective 8	4
_____	A & S Core 12	4

Note: *MYWR is your middler year writing requirement course.

Note: The co-op assignments for this program are as follows.

Six-month assignment: Summer and fall quarters following first year.

Three-month assignment: Winter of third year.

Three-month assignment: Winter of fourth year.

College of Criminal Justice

Specimen Program in Criminal Justice

First Year

Quarter 1

No.	Course	QH
CJ 1101	Admin. Crim. Just.	4
POL 1110	Intro. Politics	4
PSY 1111	Fnd. Psych. 1	4
HST 1101	Western Civ. 1	4

Quarter 2

No.	Course	QH
CJ 1112	Iss. C.J. & Crim.	4
ENG 1110	Fresh. Eng. 1	4
HST 1102	Western Civ. 2	4
POL 1111	Intro. Amer. Gov.	4

Quarter 3

No.	Course	QH
CJ 1151	Law & Legl. Pro. 1	4
ENG 1111	Fresh. Eng. 2	4
PSY 1112	Fnd. Psych. 2	4
SOC 1100	Intro. Soc.	4

Second Year

Quarter 4

No.	Course	QH
CJ 1201	Criminology	4
CJ 1251	Crim. Law	4
POL 1318	State & Loc. Gov.	4
_____	Math/Sci. Require.	4

Quarter 5

No.	Course	QH
CJ _____	Crim. Jus. Elctv.	4
CJ 1252	Crim. Due Proc.	4
_____	Math/Sci. Require.	4
_____	Non-Crim. Jus. Elctv.	4

Third Year**Quarter 6**

No.	Course	QH
CJ 1451	Crim. Jus. Res.	4
CJ _____	Crim. Jus. Elctv.	4
ECN 1115	Prin. Macroecon.	4
ENG 1350	Intrmdte. Writing	4

Quarter 7

No.	Course	QH
CJ _____	Crim. Jus. Elctv.	4
ECN 1116	Prin. Microecon.	4
_____	Non-Crim. Jus. Elctv.	4
_____	Non-Crim. Jus. Elctv.	4

Fourth Year**Fifth Year****Quarters 8-11**

No.	Course	QH
CJ _____	Crim. Jus. Elctv.	24
_____	Non-Crim. Jus. Elctv.	36

College of Engineering

Specimen Program in Chemical Engineering

All courses in chemical engineering must be taken in sequence shown.

First Year**Quarter 1**

No.	Course	QH
ENG 1111	Fresh. Eng. 2	4
GE 1100	Comp. for Engr.	4
MTH 1123	Calculus 1	4
PHY 1221	Physics for Engr. 1	4
PHY 1521	Physics Lab Engr. 1	1

Quarter 2

No.	Course	QH
CHM 1131	Gen. Chem.	4
GE 1110	Engr. Graph. and Des.	4
MTH 1124	Calculus 2	4
PHY 1222	Physics for Engr. 2	4
PHY 1522	Physics Lab Engr. 2	1

Quarter 3

No.	Course	QH
CHM 1132	Gen. Chem.	4
CHM 1138	Chem. Lab	1
ENG 1113	Gr. Th. Lit.	4
MTH 1125	Calculus 3	4
PHY 1223	Physics for Engr. 3	4

Second Year**Quarter 4**

No.	Course	QH
CHE 1201	Chm. Engr. Cln. 1	4
CHE 1205	Computation Lab	2
CHM 1271	Organic Chem. 1	3
MTH 1223	Calculus 4	4
_____	Soc. Sc/Hm. Elctv.*	4

Quarter 5

No.	Course	QH
CHE 1202	Chem. Engr. Cln. 2	4
CHM 1272	Org. Chm. 2 (& Lab)	5
MTH 1225	Math Analysis 1	4
_____	Soc. Sc/Hm. Elctv.*	4

Third Year**Quarter 6**

No.	Course	QH
CHE 1211	Chm. Engr. Therm. 1	4
CHM 1381	Phys. Chem. 1	3
CHM 1394	Exp. Phys. Chem. 1	2
MTH 1230	Linear Algebra	4
_____	Soc. Sc/Hm. Elctv.*	4

Quarter 7

No.	Course	QH
CHE 1310	Chm. Engr. Therm. 2	4
CHE 1320	Momentum Trnsprt.	4
CHM 1382	Phys. Chem. 2	3
CHM 1395	Exp. Phys. Chem. 2	2
ENG 1125	Technical Writing 1	4

Fourth Year**Quarter 8**

No.	Course	QH
CHE 1410	Exp. Methods 1	4
CHE 1421	Chm. Engr. Kintc.	4
CHE 1430	Heat Transport.	4
ECN 1115	Economics 1	4

Quarter 9

No.	Course	QH
CHE 1411	Exp. Methods 2	4
CHE 1440	Separation Procs.	4
CHE 1450	Chem. Engr. Econ.	4
_____	Soc. Sc/Hm. Elctv.*	4

Fifth Year**Quarter 10[†]**

No.	Course	QH
CHE 1501	Process Design 1	6
CHE 1512	Process Control	4
CHE _____	Chem. Engr. Elctv.*	4
_____	Adv. Chem. Elctv.*	4

Quarter 11[†] (Spring only)

No.	Course	QH
CHE 1502	Process Design 2	6
CHE _____	Chem. Engr. Elctv.*	4
CHE _____	Chem. Engr. Elctv.*	4
_____	Engr. Elctv.*	4

Quarters 4, 6, 8, and 10 offered fall and winter. Quarters 5, 7, and 9 offered spring and summer.

*From lists of approved electives, taken quarter 10 or 11 as offered.

[†]Quarters 10 and 11 must be approved by department adviser.

All elective courses must satisfy departmental design, engineering science, and social science/humanities requirements.

Specimen Program in Civil Engineering

First Year

Quarter 1

No.	Course	QH
ENG 1111	Fresh. Engl. 2	4
GE 1100	Comp. for Engr.	4
MTH 1123	Calculus 1	4
PHY 1221	Physics I	4
PHY 1521	Physics Lab for Engr. 1	1

Quarter 2

No.	Course	QH
CHM 1131	Gen. Chem. 1	4
GE 1110	Engr. Graph. & Des.	4
MTH 1124	Calculus 2	4
PHY 1222	Physics 2	4
PHY 1522	Physics Lab for Engr. 2	1

Quarter 3

No.	Course	QH
COM 1110	FORTTRAN Lab	1
CHM 1132	Gen. Chem. 2	4
ENG 1113	Gr. Th. Lit.	4
MTH 1125	Calculus 3	4
PHY 1223	Physics 3	4

Second Year

Quarter 4

No.	Course	QH
CIV 1210	Struct. Mech. 1	4
CIV 1510	Materials	4
CIV 1511	Materials Lab	2
MTH 1223	Calculus 4	4
_____	Soc Sc/Hm Elect	4

Quarter 5

No.	Course	QH
CIV 1211	Struct. Mech. 2	4
CIV 1620	Engr. Meas.	4
CIV 1621	Engr. Meas. Lab	2
ECN 1116	Prin. of Microecon.	4
MTH 1225	Math. Analysis 1	4

Third Year

Quarter 6

No.	Course	QH
CIV 1220	Struc. Anal. 1	4
CIV 1226	St. An. & Ds. Lab	2
CIV 1310	Fluid Mech.	4
MTH 1230	Linear Algebra	4
_____	Soc. Sc./Hm. Electv.	4

Quarter 7

No.	Course	QH
CIV 1240	Concrete Des. 1	4
CIV 1340	Environ. Engr. 1	4
CIV 1410	Soil Mechanics	4
CIV 1411	Soil Mech. Lab	2
ENG 1125	Technical Writing 1	4

Fourth Year

Quarter 8

No.	Course	QH
CIV 1250	Des. Steel Struc. 1	4
CIV 1625	C.E. Computer Lab	1
CIV 1640	Applied Probability	4
_____	Tech. Elective	4
_____	Tech. Elective	4

Quarter 9

No.	Course	QH
CIV 1665	Prof. Issues	1
IIS 1366	Engr. Economy	4
ME 1320	Dynamics for C.E.	4
_____	Tech. Elective	4
_____	Tech. Elective	4

Fifth Year

Quarter 10

No.	Course	QH
_____	Tech. Elective	4
_____	Tech. Elective	4
_____	Soc. Sc./Hum. Elective	4
_____	Tech. or Capstone Elective	4

Quarter 11

No.	Course	QH
_____	Gen. Elective*	4
_____	Tech. Elective	4
_____	Tech. or Capstone Elective	4
_____	Soc. Sc./Hum. Elective	4

*This may be a technical or arts and sciences elective or any other 4 QH course given at the University. The general elective may be interchanged with an arts and sciences elective in another quarter, with the approval of the civil engineering department.

During quarter 11 you must enroll in *one* of four capstone electives which will be offered by the civil engineering department. You will have to use some of your technical electives to fulfill prerequisites for the capstone. Make your selections as follows.

Area	Quarter 8	Quarter 9	Quarter 10	Quarter 11
Environmental	CIV 1320	CIV 1341	CIV 1350	Capstone
Structures	CIV 1241	CIV 1251 CIV 1222	Capstone	
Transportation	CIV 1540	CIV 1630	CIV 1530	Capstone
Geotechnical		CIV 1420	CIV 1550	Capstone

Your remaining technical electives must include a minimum of 11 design credits.

Students must select the capstone, eight technical, and four social science/humanities electives from the approved lists available in Student Services, 220 Snell Engineering Center or in the civil engineering department office, 420 Snell Engineering Center.

Important Note Regarding Technical Electives

The capstone elective that you choose will have a number of prerequisites that are technical electives. Plan your technical elective selections carefully, *prior to quarter 8*, to insure that you will have acquired the specific prerequisites for your preferred capstone elective.

Specimen Program for the Part-Time Evening Civil Engineering BS Program

First Year

Fall Quarter

No.	Course	QH
GE 1100	Comp. for Engr.	4
MTH 1123	Calculus 1	4

Winter Quarter

No.	Course	QH
CHM 1131	Chemistry 1	4
COM 1110	FORTTRAN Lab	1
MTH 1124	Calculus 2	4

Spring Quarter

No.	Course	QH
CHM 1132	Chemistry 2	4
MTH 1125	Calculus 3	4

Second Year

Fall Quarter

No.	Course	QH
MTH 1223	Calculus 4	4
PHY 1221	Physics 1	4
PHY 1521	Physics Lab for Engr. 1	1

Winter Quarter

No.	Course	QH
MTH 1225	Math Analysis 1	4
PHY 1222	Physics 2	4
PHY 1522	Physics Lab for Engr. 2	1

Spring Quarter

No.	Course	QH
GE 1110	Engr. Graph. & Des.	4
PHY 1223	Physics 3	4

Third Year

Fall Quarter

No.	Course	QH
CIV 1210	Struct. Mech. 1	4
CIV 1620	Engr. Meas.	4

Winter Quarter

No.	Course	QH
CIV 1211	Struct. Mech. 2	4
MTH 1230	Linear Algebra	4

Spring Quarter

No.	Course	QH
CIV 1410	Soil Mechanics	4
CIV 1411	Soil Mech. Lab	2
ENG 1125	Technical Writing	4

Fourth Year

Fall Quarter

No.	Course	QH
CIV 1220	Struct. Anal. 1	4
CIV 1226	St. An. & Ds. Lab*	2
CIV 1310	Fluid Mech.	4

Winter Quarter

No.	Course	QH
CIV 1240	Concrete Des. 1	4
CIV 1340	Environ. Engr. 1	4

Spring Quarter

No.	Course	QH
CIV 1250	Des. Steel Struct. 1	4
CIV 1625	CE Computer Lab	1
CIV 1640	Applied Probability	4

Fifth Year*

Fall Quarter

No.	Course	QH
CIV 1241	Concrete Des. 2 ^s or	4
CIV 1341	Environ. Engr. 2 ^s	4
	General Elective	4

Winter Quarter

No.	Course	QH
IIS 1366	Engr. Economy	4
ME 1320	Dynamics	4

Spring Quarter

No.	Course	QH
CIV 1510	Materials	4
CIV 1511	Materials Lab [†]	2
CIV 1540	Highway Engr. or ^s	4
CIV 1550	Construction Mgt. [§]	4

Sixth Year (Odd)*

Fall Quarter

No.	Course	QH
CIV 1341	Environ. Engr. 2 ^s	4
CIV 1420	Foundation Engr. [§]	4

Winter Quarter

No.	Course	QH
CIV 1320	Hydraulic Engr. [§]	4
CIV 1350	Environ./Hyd. Lab [§]	4

Spring Quarter

No.	Course	QH
CIV 1395	Environ. Des. Proj.	4
CIV 1540	Highway Engr. [§]	4

Sixth Year (Even)

Fall Quarter

No.	Course	QH
CIV 1241	Concrete Des. 2 ^s	4
CIV 1420	Foundation Engr. [§]	4

Winter Quarter

No.	Course	QH
CIV 1222	Struct. Anal. 2 ^s	4
CIV 1251	Des. Steel Struct. 2 ^s	4

Spring Quarter

No.	Course	QH
CIV 1295	Struct. Des. Proj.	4
CIV 1550	Construction Mgt. [§]	4

Students must also take the following required courses, available during the summer quarter, plus five adviser-approved 4 QH social science/humanities electives for a total of eight courses in this subject area: ENG 1111, Freshman English 1; ENG 1113, Great Themes in Literature; and ECN 1116, Microeconomics.

* Offered even years only (for example, fall 1994 of the 1994–1995 academic year).

† Offered odd years only (for example, spring 1996 of the 1995–1996 academic year).

‡ Year six courses may be taken before year five. During years five/six students must take seven technical electives, designated here by §. These electives must supply a minimum of eleven design credits. Select year five/six order based on course offering preference. "Odd" refers to academic years beginning fall 1991. "Even" refers to academic years beginning fall 1990.

§ Students must take one capstone design projects course, designated by ||.

Specimen Program in Computer Engineering

First Year

Quarter 1

No.	Course	QH
ENG 1111	Fresh. Eng. 2	4
GE 1100	Computers for Eng'g.	4
MTH 1123	Calculus 1	4
PHY 1221	Physics 1	4
PHY 1521	Physics Lab for Eng 1	1

Second Year

Third Year

Fourth Year

Fifth Year

Quarter 2

No.	Course	QH
CHM 1131	Chem. 1	4
GE 1110	Eng'g. Graph. & Des.	4
MTH 1124	Calculus 2	4
PHY 1222	Physics 2	4
PHY 1522	Physics Lab for Eng 2	1

Quarter 4

No.	Course	QH
ECE 1215	Circuits & Systems 1	4
ECE 1221	Measure Lab	1
MTH 1223	Calculus 4	4
PHY 1224	Physics 4	4
_____	Soc. Sc./Hm. Electv.	4

Quarter 6

No.	Course	QH
ECE 1217	Circuits & Systems 3	4
ECE 1223	Circuit Lab 2	1
ECE 1346	Electronics 1	4
ECE 1381	Comp. Eng'g. 1	4
ME 1340	Thermodynamics or	4
ME 1386	Material Science	4

Quarter 8

No.	Course	QH
ECE 1225	Electr. Lab 2	1
ECE 1226	Discrete Sys. Lab	1
ECE 1333	Linear Sys. 2	4
ECE 1349	Electr. Des. 1	4
ECE 1363	Electromag. Fld.	4
_____	Theory 1	4
ECE 1383	Comp. Eng'g. 3	4
_____	Soc. Sc./Hm. Electv.	4

Quarter 10

No.	Course	QH
ECE 1228	Electromag. Flds.	4
_____	Lab 2	4
ECE 1230	VLSI Sys. Design Lab	2
ECE 1351	Top. In. IC Des.	4
ECE 1365	Flds. & En. Conv.	4
ECE 1454	Comm. Systems	4
_____	Soc. Sci./Hum. Elect.	4

Quarter 3

No.	Course	QH
CHM 1132	Chem. 2	4
COM 1110	FORTTRAN Lab	1
ENG 1113	Gr. Th. Lit.	4
MTH 1125	Calculus 3	4
PHY 1223	Physics 3	4

Quarter 5

No.	Course	QH
ECE 1216	Circuits & Systems 2	4
ECE 1222	Circuit Lab 1	1
ME 1321	Mechanics for E.E.	4
MTH 1225	Math Analysis 1	4
_____	Soc. Sc./Hm. Electv.	4

Quarter 7

No.	Course	QH
ECE 1224	Electr. Lab 1	1
ECE 1229	Dig. Syst. Lab	1
ECE 1332	Linear Sys. 1	4
ECE 1347	Electronics 2	4
ECE 1382	Computer Eng'g. 2	4
ENG 1125	Tech. Writing	4

Quarter 9

No.	Course	QH
ECE 1227	Electromag. Flds.	1
_____	Lab 1	4
ECE 1364	Electromag. Fld.	4
_____	Theory 2	4
ECE 1384	Comp. Eng'g. 4	4
MTH 1384	Probability	4
_____	Soc. Sc./Hm. Electv.	4

Quarter 11

No.	Course	QH
_____	Tech Elective	4
_____	Tech. Elective	4
_____	Tech. Elective	4
_____	Soc. Sc./Hum. Elective	4

Quarters 4, 6, 8, and 10 offered fall and winter.

Quarters 5, 7, and 9 offered spring and summer.

All elective courses must satisfy departmental design, engineering science and social science/humanities requirements.

Specimen Program in Electrical Engineering

First Year

Quarter 1

No.	Course	QH
ENG 1111	Fresh. Eng. 2	4
GE 1100	Comp. for Engr.	4
MTH 1123	Calculus 1	4
PHY 1221	Physics 1	4
PHY 1521	Physics Lab for Eng. 1	1

Second Year

Quarter 2

No.	Course	QH
CHM 1131	Gen. Chem. 1	4
GE 1110	Engr. Graph. & Des.	4
MTH 1124	Calculus 2	4
PHY 1222	Physics 2	4
PHY 1522	Physics Lab for Eng. 2	1

Quarter 4

No.	Course	QH
ECE 1215	Circ. & Sys. 1	4
ECE 1221	Measurements Lab	1
MTH 1223	Calculus 4	4
PHY 1224	Physics 4	4
_____	Soc. Sc./Hm. Elec.	4

Quarter 3

No.	Course	QH
CHM 1132	Gen. Chem. 2	4
COM 1110	FORTTRAN Lab	1
ENG 1113	Gr. Th. Lit.	4
MTH 1125	Calculus 3	4
PHY 1223	Physics 3	4

Quarter 5

No.	Course	QH
ECE 1216	Circ. & Sys. 2	4
ECE 1222	Circuit Lab 1	1
ME 1321	Mechanics for E.E.	4
MTH 1225	Math Analysis 1	4
_____	Soc. Sc./Hm. Elec.	4

Third Year

Quarter 6		
No.	Course	QH
ECE 1217	Cir. & Sys. 3	4
ECE 1346	Electron. 1	4
ECE 1381	Comp. Eng'g. 1	4
ME 1340	Therm. 1 <i>or</i>	4
ECE 1223	Circuits Lab 2	1
ME 1386	Materials Sci.	4

Quarter 7		
No.	Course	QH
ECE 1224	Electronics Lab 1	1
ECE 1229	Dig. Syst. Lab 1	1
ECE 1332	Linear Sys. 1	4
ECE 1347	Electron. 2	4
ECE 1382	Comp. Eng'g. 2	4
ENG 1125	Tech. Writing	4

Fourth Year

Quarter 8		
No.	Course	QH
ECE 1225	Electronics Lab 2	1
ECE 1226	Discrete Sys. Lab 1	1
ECE 1333	Linear Sys. 2	4
ECE 1349	Electronic Des. 1	4
ECE 1363	Electromag. Fld. Theory 1	4
ECE 1383	Comp. Eng'g. 3	4

Quarter 9		
No.	Course	QH
ECE 1227	Electromag. Flds. Lab 1	1
ECE 1364	Electromag. Flds. Theory 2	4
MTH 1384	Probability for E.E.	4
_____	Soc. Sci./Hum. Elect.	4
_____	Tech. Elective	4

Fifth Year

Quarter 10		
No.	Course	QH
ECE 1228	Electromag. Flds. Lab 2	1
ECE 1365	Flds. & En. Conv.	4
ECE 1454	Comm. Systems	4
_____	Soc. Sci./Hum. Elect.	4
_____	Tech. Elective	4

Quarter 11		
No.	Course	QH
ECE 1408	Physical Electron <i>or</i>	4
ECE 1420	Control Systems* <i>or</i>	4
ECE 1465	Wave Trans. & Recept.	4
_____	Soc. Sci./Hum. Elect.	4
_____	Tech. Elective	4
_____	Tech. Elective	4

*Plus ECE 1235 Control Lab, 1 QH.

Specimen Program in Power Systems

First Year

Quarter 1		
No.	Course	QH
ENG 1111	Fresh. Eng. 2	4
GE 1100	Comp. for Engr.	4
MTH 1123	Calculus 1	4
PHY 1221	Physics 1	4
PHY 1521	Physics Lab for Engr. 1	1

Quarter 2		
No.	Course	QH
CHM 1131	Gen. Chem. 1	4
GE 1110	Engr. Graph. & Des.	4
MTH 1124	Calculus 2	4
PHY 1222	Physics 2	4
PHY 1522	Physics Lab for Engr. 2	1

Quarter 3		
No.	Course	QH
CHM 1132	Gen. Chem.	4
COM 1110	FORTRAN Lab	1
ENG 1113	Gr. Th. Lit.	4
MTH 1125	Calculus 3	4
PHY 1223	Physics 3	4

Second Year

Quarter 4		
No.	Course	QH
ECE 1215	Cir. & Systems 1	4
ECE 1221	Measurement Lab	1
MTH 1223	Calculus 4	4
PHY 1224	Physics 4	4
_____	Soc. Sc./Hm. Electv.	4

Quarter 5		
No.	Course	QH
ECE 1216	Cir. & Systems 2	4
ECE 1222	Circuit Lab	1
ME 1321	Mechanics for E.E.	4
MTH 1225	Math Analysis 1	4
_____	Soc. Sc./Hm. Electv.	4

Third Year

Quarter 6		
No.	Course	QH
ECE 1217	Cir. & Sys. 3	4
ECE 1223	Circuit Lab 2	1
ECE 1346	Electron. 1	4
ECE 1381	Comp. Engr. 1	4
ME 1360	Thermo 1	5

Quarter 7		
No.	Course	QH
ECE 1224	Electron. Lab 1	1
ECE 1229	Dis. Syst. Lab	1
ECE 1332	Linear Sys. 1	4
ECE 1347	Electron. 2	4
ECE 1382	Comp. Engr. 2	4
ENG 1125	Tech. Writing	4

Quarters 4 and 6 offered fall and winter.
Quarters 5 and 7 offered spring and summer.

Fourth Year

Quarter 8 (Fall Only)		
No.	Course	QH
ECE 1225	Electronics Lab 2	1
ECE 1226	Discrete Sys. Lab 1	1
ECE 1333	Linear Sys. 2	4
ECE 1349	Electronic Des. 1	4
ECE 1363	Electromag. Th. 1	4
_____	Soc. Sc./Hm. Elect.	4

Quarter 9 (Spring Only)		
No.	Course	QH
ECE 1227	Electromag. Flds. Lab 1	1
ECE 1364	Electromag. Flds. Theory 2	4
ECE 1471	Elect. Power Sys.	4
MTH 1384	Probability for E.E.	4
_____	Soc. Sci./Hum. Elect.	4

Fifth Year**Quarter 10
(Winter Only)**

No.	Course	QH
ECE 1228	Electromag. Flds. Lab 2	1
ECE 1231	Elect. Pwr. Lab 1	1
ECE 1365	Flds. & En. Conv.	4
ECE 1472	Elect. Pwr. Sys.	4
	Soc. Sci./Hum. Elect.	4
	Tech. Elective	4

**Quarter 11
(Spring Only)**

No.	Course	QH
ECE 1232	Elect. Pwr. Lab 2	2
ECE 1371	Elect. Mach. 1	4
ECE 1379	Trans. Pwr. Sys.	4
ECE 1474	Power Electronics	4
	Tech. Elective	4

All elective courses must satisfy departmental design, engineering science and social science/humanities requirements.

Specimen Program for the Part-Time B.S. Evening Program in Electrical and Computer Engineering

First Year**Fall Quarter**

No.	Course	QH
GE 1100	Comp. for Engr.	4
MTH 1123	Calculus 1	4

Winter Quarter

No.	Course	QH
CHM 1131	Chemistry 1	4
COM 1110	FORTRAN Lab	1
MTH 1124	Calculus 2	4

Spring Quarter

No.	Course	QH
CHM 1132	Chemistry 2	4
MTH 1125	Calculus 3	4

Second Year**Fall Quarter**

No.	Course	QH
MTH 1223	Calculus 4	4
PHY 1221	Physics 1	4
PHY 1521	Physics Lab for Engr. 1	1

Winter Quarter

No.	Course	QH
MTH 1225	Math Analysis 1	4
PHY 1222	Physics 2	4
PHY 1522	Physics Lab for Engr. 2	1

Spring Quarter

No.	Course	QH
GE 1110	Engr. Graph. & Des.	4
PHY 1223	Physics 3	4

Third Year**Fall Quarter**

No.	Course	QH
ECE 1215	Circuits & Sys. 1	4
ECE 1221	Measurement Lab	1
PHY 1224	Physics 4	4

Winter Quarter

No.	Course	QH
ECE 1216	Circuits & Sys. 2	4
ECE 1222	Circuits Lab 1	1
ME 1321	Mechanics	4

Spring Quarter

No.	Course	QH
ECE 1217	Circuits & Sys. 3	4
ECE 1223	Circuits Lab 2	1
MTH 1384	Probability	4

Fourth Year**Fall Quarter**

No.	Course	QH
ECE 1332	Linear Systems 1	4
ECE 1346	Electronics 1	4

Winter Quarter

No.	Course	QH
ECE 1224	Electronics Lab 1	1
ECE 1226	Dis. Sys. Lab 1	1
ECE 1333	Linear Systems 2	4
ECE 1347	Electronics 2	4

Spring Quarter

No.	Course	QH
ECE 1225	Electronics Lab 2	1
ECE 1349	Electronic Design	4
ME 1340	Thermodynam. 1 or	4
ME 1386	Materials Science	4

Fifth Year**Fall Quarter**

No.	Course	QH
ECE 1363	E/M Fld. Theory 1	4
ECE 1381	Comp. Engr. 1	4

Winter Quarter

No.	Course	QH
ECE 1227	Fields Lab 1	1
ECE 1229	Dig. Sys. Lab	1
ECE 1364	E/M Fld. Theory 2	4
ECE 1382	Comp. Engr. 2	4

Spring Quarter

No.	Course	QH
ECE 1228	Fld. & EC Lab	1
ECE 1365	Fld. & En. Con.	4
ECE 1383	Comp. Engr. 3	4

Sixth Year**Fall Quarter**

No.	Course	QH
Choose 2 technical electives		
ECE 1230	VLSI Lab	2
ECE 1235	Control Sys. Lab	1
ECE 1351	Spcl. Tpc. IC Des.	4
ECE 1408	Phys. Electronics	4
ECE 1420	Control Systems	4
ECE 1454	Communication Sys.*	4
ECE 1486	Num. Meth. & CA	4

Winter Quarter

No.	Course	QH
Choose 2 technical electives		
ECE 1230	VLSI Lab	2
ECE 1235	Control Sys. Lab.	1
ECE 1351	Spcl. Tpc. IC Des.	4
ECE 1384	Comp. Engr. 4	4
ECE 1420	Control Systems	4
ECE 1471	Power Systems 1	4
MTH 1351	Func. Comp. Var.	4

Spring Quarter

No.	Course	QH
ECE 1454	Communication Sys.	4
<i>and</i>		
Choose 1 technical elective		
ECE 1234	DSP Lab	4
ECE 1456	Dig. Sig. Proc.	4
ECE 1465	Wave Trans. & Rec.	4
MTH 1301	Linear Algebra	4

Students must take the following courses, available during the summer quarter: ENG 1111, Freshman English 1; ENG 1113, Great Themes in Literature; ENG 1125, Technical Writing 1; and five social science/humanities courses.

Technical electives must include at least one from the following: ECE 1408, Physical Electronics; ECE 1420, Control Systems; and ECE 1465, Wave Transmission & Reception. Students must take a minimum of 24 QH of design credits to meet the graduation requirement.

The computer engineering option requires ECE 1351, Special Topics in IC Design; ECE 1230, VLSI System Design Lab; and ECE 1384, Computer Engineering 4.

*ECE 1454, a required course, is also offered in the spring quarter.

Specimen Program in General Engineering**First Year****Quarter 1**

No.	Course	QH
ENG 1111	Fresh. Eng. 2	4
GE 1100	Comp. for Engr.	4
MTH 1123	Calculus	4
PHY 1221	Physics 1	4
PHY 1521	Physics Lab for Engr. 1	1

Quarter 2

No.	Course	QH
GE 1110	Engr. Graph. & Des.	4
MTH 1124	Calculus 2	4
PHY 1222	Physics 2	4
PHY 1522	Physics Lab for Engr. 2	1
_____	Soc. Sc./Hm. Electv.	4

Quarter 3

No.	Course	QH
ENG 1113	Gr. Th. Lit.	4
MTH 1125	Calculus 3	4
PHY 1223	Physics 3	4
_____	Soc. Sc./Hm. Electv.	4
_____	Lab Elective	1

Second Year**Quarter 4**

No.	Course	QH
MTH 1223	Calculus 4	4
PHY 1224	Physics 4	4
_____	Engr. Sci. Electv.	4
_____	Soc. Sc./Hm. Electv.	4

Quarter 5

No.	Course	QH
MTH 1225	Math Analysis 1	4
_____	Engr. Sci. Electv.	4
_____	Coord. Study Electv.	4
_____	Soc. Sc./Hm. Electv.	4

Third Year**Quarter 6**

No.	Course	QH
ENG 1340	Writ. Wkshp. 1	1
_____	Engr. Sci. Electv.	4
_____	Coord. Study Electv.	4
_____	Coord. Study Electv.	4
_____	Soc. Sc./Hm. Electv.	4

Quarter 7

No.	Course	QH
_____	Engr. Sci. Electv.	4
_____	Engr. Sci. Electv.	4
_____	Coord. Study Electv.	4
_____	Soc. Sc./Hm. Electv.	4

Fourth Year**Quarter 8**

No.	Course	QH
_____	Engr. Sci. Electv.	4
_____	Engr. Sci. Electv.	4
_____	Coord. Study Electv.*	4
_____	Coord. Study Electv.	4

Quarter 9

No.	Course	QH
_____	Engr. Sci. Electv.	4
_____	Engr. Sci. Electv.	4
_____	Coord. Study Electv.	4
_____	Coord. Study Electv.	4

Fifth Year**Quarter 10**

No.	Course	QH
_____	Engr. Sci. Electv.	4
_____	Engr. Sci. Electv.	4
_____	Coord. Study Electv.	4
_____	Coord. Study Electv.	4

Quarter 11

No.	Course	QH
_____	Engr. Sci. Electv.	4
_____	Coord. Study Electv.	4
_____	Coord. Study Electv.	4
_____	Coord. Study Electv.	4

Note: Quarters 6, 8, and 10 offered fall and winter; quarters 5, 7, and 9 offered spring and summer.

*Coordinated Study electives are courses chosen to meet the student's career objectives; these courses will be selected in conjunction with the student's adviser and are subject to the adviser's approval.

Specimen Program in Industrial Engineering

First Year

Quarter 1				Quarter 2				Quarter 3			
No.	Course		QH	No.	Course		QH	No.	Course		QH
ENG 1111	Fresh. Eng. 2		4	CHM 1131	Gen. Chem. 1		4	CHM 1132	Gen. Chem.		4
GE 1100	Comp. for Engr.		4	GE 1110	Engr. Graph. & Des.		4	ENG 1113	Gr. Th. Lit.		4
MTH 1123	Calculus 1		4	MTH 1124	Calculus 2		4	IIS 1111	Applied Engr. Software*		1
PHY 1221	Physics 1		4	PHY 1222	Physics 2		4	MTH 1125	Calculus 3		4
PHY 1521	Physics Lab for Engr. 1		1	PHY 1522	Physics Lab for Engr. 2		1	PHY 1223	Physics 3		4

*Class of 1992 and beyond.

Second Year

Quarter 4				Quarter 5			
No.	Course		QH	No.	Course		QH
ECN 1115	Prin. of Macroecon.		4	ECN 1116	Prin. of Microecon.		4
IIS 1200	Work Des.		4	IIS 1300	Probabilistic Analysis for Engr.		4
MTH 1223	Calculus 4		4	ME 1201	Statics		5
PHY 1224	Physics 4		4	MTH 1225	Math Analysis 1		4

Third Year

Quarter 6				Quarter 7			
No.	Course		QH	No.	Course		QH
ECE 1171	Elec. Engr. 1		4	IIS 1320	Statistics 2		4
IIS 1310	Statistics 1		4	IIS 1340	Operations Res. 1		4
IIS 1330	Comp. & Prog. 1		4	_____	Engr. Sci. Elect.		4
MTH 1230	Linear Algebra		4	_____	Technical Elective		4
_____	Math Elective		4				

Fourth Year

Quarter 8				Quarter 9			
No.	Course		QH	No.	Course		QH
ENG 1125	Technical Writing		4	IIS 1360	Engr. Econ. & Stat. Dec. Thry.		4
IIS 1341	Operations Res. 2		4	IIS 1405	Prod. Inv. Control		4
IIS 1350	Dig. Sim. Tech.		4	_____	Engr. Sci. Elect.		4
IIS 1400	Systems 1		4	_____	Behavioral Sci. Elective		4
_____	Behavioral Sci. Elective		4				

Fifth Year

Quarter 10				Quarter 11			
No.	Course		QH	No.	Course		QH
IIS 1401	Design Project		4	_____	Tech Elective		4
IIS 1480	People in Orgns.		4	_____	Tech Elective		4
_____	Tech Elective		4	_____	Open Elective		4
_____	Soc. Sci./Hm. Elective		4	_____	Soc. Sci./Hm. Elective		4

The elective courses completed must have a combined total of at least eleven engineering science credits and ten design credits.

Specimen Program in Mechanical Engineering

First Year

Quarter 1				Quarter 2				Quarter 3			
No.	Course		QH	No.	Course		QH	No.	Course		QH
ENG 1111	Fresh. Eng. 2		4	CHM 1131	Gen. Chem. 1		4	CHM 1131	Gen. Chem. 2		4
GE 1100	Comp. for Engr.		4	GE 1100	Engr. Graph. & Des.		4	ENG 1113	Gr. Th. Lit.		4
MTH 1123	Calculus 1		4	MTH 1124	Calculus 2		4	ME 1111	Key Ideas in Engr.		1
PHY 1221	Physics 1		4	PHY 1222	Physics 2		4	MTH 1125	Calculus 3		4
PHY 1521	Physics Lab for Engr. 1		1	PHY 1522	Physics Lab for Engr. 2		1	PHY 1223	Physics 3		4

Second Year

Quarter 4				Quarter 5			
No.	Course		QH	No.	Course		QH
ECN 1115	Prin. of Macroecon.		4	ECN 1115	Prin. of Microecon.		4
	or				or		
ME 1392	Meas. and Analysis		5	ME 1392	Meas. and Analysis		5
ME 1201	Statics		5	ME 1202	Dynamics I		5
ME 1360	Thermodynamics 1		5	ME 1361	Therm. 2		5
MTH 1223	Calculus 4		4	MTH 1225	Math Analysis 1		4

Third Year**Quarter 6**

No.	Course	QH
ENG 1340	Writing Workshop	1
ME 1203	Strgth Mat. 1	5
ME 1315	Dynamics 2	4
ME 1375	Fluid Mechanics	5
MTH 1230	Linear Algebra	4

Quarter 7

No.	Course	QH
ECE 1171	Elect. Engr.	4
ME 1314	Strgth Mat. 2	4
ME 1365	Heat Transfer	5
MTH 1226	Math. Analysis 2	4

Fourth Year**Quarter 8**

No.	Course	QH
ME 1380	Materials Science	5
ME 1335	Mechanical Design	5
	or	
ME 1337	Thermal Design	5
ME 1362	Thermodynamics 3	5
	Soc. Sc./Hm. Elec.	4

Quarter 9

No.	Course	QH
ME 1335	Mechanical Design	5
	or	
ME 1337	Thermal Design	5
ME 1415	Mech. Vibrations	5
	Soc. Sc./Hm. Elec.	4
	Physics/Sci. Elec.	4

Fifth Year**Quarter 10**

No.	Course	QH
ME 1336	Design Project 1	5
	Tech. Elective	4
	Tech. Elective	4
	Soc. Sci./Hm. Elec.	4

Quarter 11

No.	Course	QH
ME 1338	Design Project 2	5
	Tech. Elective	4
	Tech. Elective	4
	Soc. Sci./Hm. Elec.	4

Specimen Program for the Part-Time Evening BS Program in Mechanical Engineering**First Year****Fall Quarter**

No.	Course	QH
GE 1100	Comp. for Engr.	4
MTH 1123	Calculus 1	4

Winter Quarter

No.	Course	QH
CHM 1131	Chemistry 1	4
MTH 1124	Calculus 2	4

Spring Quarter

No.	Course	QH
CHM 1132	Chemistry 2	4
MTH 1125	Calculus 3	4

Second Year**Fall Quarter**

No.	Course	QH
MTH 1223	Calculus 4	4
PHY 1221	Physics 1	4

Winter Quarter

No.	Course	QH
MTH 1225	Math Anal. 1	4
PHY 1222	Physics 2	4
PHY 1522	Physics Lab for Engr. 2	1

Spring Quarter

No.	Course	QH
MTH 1226	Math Anal. 2	4
PHY 1223	Physics 3	4

Third Year**Fall Quarter**

No.	Course	QH
ME 1201	Statics*	5
PHY 1224	Physics 4	4

Winter Quarter

No.	Course	QH
ME 1392	Meas. & Analysis†	5
MTH 1230	Linear Algebra	4

Spring Quarter

No.	Course	QH
ME 1360	Thermodynamics 1*	5
GE 1110	Engr. Graph & Des.	4

Fourth Year**Fall Quarter**

No.	Course	QH
ME 1203	Strgth. Mat. 1†	5
ME 1361	Thermodynamics 2*	5

Winter Quarter

No.	Course	QH
ME 1202	Dynamics 1*	5
ME 1375	Fluid Mechanics†	5

Spring Quarter

No.	Course	QH
ME 1314	Strgth. Mat. 2	4
ME 1365	Heat Transfer†	5

Fifth Year**Fall Quarter**

No.	Course	QH
ME 1315	Dynamics 2	4
ME 1335	Mechanical Design	5

Winter Quarter

No.	Course	QH
ME 1336	Design Project 1	5
ME ———	Tech. Elective	4

Spring Quarter

No.	Course	QH
ME 1338	Design Project 2	5
ME 1415	Mech. Vibrations†	5
ME ———	Tech. Elective	4

Sixth Year

Fall Quarter			Winter Quarter			Spring Quarter		
No.	Course	QH	No.	Course	QH	No.	Course	QH
ME 1362	Thermodynamics 3 [†]	5	ECE 1171	Elect. Engr. 1	4	ME 1337	Thermal Design	5
ME 1380	Materials Science [†]	5	ME ———	Tech. Elective	4	ME 1480	Beh. Materials	4

ENG 1340, Writing Workshop, required in the sixth year, is offered in the fall, winter, or spring quarter. Students must take the following required courses, available during the summer quarter: ECN 1115, Principles of Macroeconomics; ECN 1116, Principles of Microeconomics; ENG 1111, Introduction to Literature; and ENG 1113, Great Themes. Four additional social science/humanities courses are also required. (See College of Engineering requirements as to depth and breadth.)

[†]Additional class time is required.

[†]Lab is required.

Specimen BS/MS Program in Mechanical Engineering

Freshmen year students admitted without advanced standing credit may take either the regular or the honors courses.

Second Year

Quarter 4			Quarter 5		
No.	Course	QH	No.	Course	QH
ECN 1115	Prin. and Prob. of Econ.	4	ECE 1171	Electrical Engr.	4
ME 1201	Statics	5	ME 1202	Dynamics 1	5
ME 1360	Thermodynamics 1	5	ME 1361	Thermodynamics 2	5
ME 1392	Meas. & Analysis	5	ME 1380	Materials Sci.	5
MTH 1223	Calculus 4	5	MTH 1225	Math Analysis 1	4
			—————	Soc. Sci./Hum. Elect.	4

Third Year

Quarter 6			Quarter 7		
No.	Course	QH	No.	Course	QH
ME 1203	Strgth Mat. 1	5	ME 1314	Strgth Mat. 2	4
ME 1315	Dynamics 2	4	ME 1365	Heat Transfer	5
ME 1375	Fluid Mech. 1	5	ME 1415	Mech. Vibrations	4
MTH 1230	Linear Algebra	4	MTH 1226	Math Analysis 2	4
			—————	Phy./Sci. Elective	4

Fourth Year

Quarter 8			Quarter 9		
No.	Course	QH	No.	Course	QH
ME 1335	Mechanical Design	5	ME 1335	Mechanical Design	5
	or			or	
ME 1337	Thermal Design	5	ME 1337	Thermal Design	5
ME 1336	Design Project 1	5	ME 1338	Design Project 2	5
ME 1362	Thermodynamics 3	5	—————	Tech. Elective	4
ME 3100	Math Meth.	4	—————	Tech. Elective	4
—————	Tech. Elective	4	—————	Soc. Sci./Hum. Elec.	4

Fifth Year

Quarter 10			Quarter 11			Quarter 12		
No.	Course	QH	No.	Course	QH	No.	Course	QH
—————	Grad. Course	4	—————	Grad. Course	4	—————	Grad. Course	4
—————	Grad. Course	4	—————	Grad. Course	4	—————	Grad. Course	4
—————	Grad. Course	4	—————	Thesis	4	—————	Thesis	3
—————	Seminar (Thesis)	1						
—————	Tech. Elective	4						

Two additional social science/humanity courses are required, which may be taken at night while on co-op (by petition), or students can elect to eliminate a co-op quarter during the fourth year (by petition).

Social science/humanities courses must satisfy depth and breadth requirements.

A 3.3 or better QPA is required for admission to the program after the freshman year. Freshmen are eligible for entry only through the Admissions Department prior to enrolling at Northeastern. All students must maintain a 3.0 or better QPA to stay in the program.

A complete program must be arranged with, and approved by, a faculty adviser no later than the end of the third year. The program will vary for each student and the above is only a sample arrangement.

Consult the *Mechanical Engineering Undergraduate Curriculum Guide* for information regarding choice of BS electives.

Graduate courses are selected according to the graduate degree requirements listed in the *Graduate School of Engineering Student Guide and Catalog*.

School of Engineering Technology

Specimen Program in Aerospace Maintenance

First Year

Quarter 1

No.	Course	QH
ENG 1100	Fresh. Eng. 1	4
GET 1170	Graphics 1	4
MTH 1194	Calculus 2	4
PHY 1191	Physics 1	4
PHY 1196	Physics Lab 1	1

Second Year

Third Year

Quarter 2

No.	Course	QH
ENG 1111	Fresh. Eng. 2	4
GET 1100	Cp. Pg. for Engr. Tch.	4
PHY 1192	Physics 2	4
PHY 1197	Physics Lab 2	1
_____	Soc. Sc./Hm. Electv.	4

Quarter 4

No.	Course	QH
ECN 1115	Econ. Prin.	4
EET 1320	Elec. & Elec. 1	4
ENG 1340	Writ. Wkshp.	1
MET 1301	Mechanics A	4
MET 1340	Thermo. A.	4

Quarter 6

No.	Course	QH
MET 1315	Strss. Anal. B or	4
MET 1341	Thermo. B	4
MET 1390	Meas. & Ana. Lab	2
MET 1481	Materials B	4
_____	Tech. Elective	4
_____	Soc. Sc./Hm. Electv.	4
_____	Open Electv.	

Quarter 3

No.	Course	QH
ENG 1114	Fresh. Tech. Writ.	4
GET 1171	Graphics 2	4
MTH 1195	Calculus 3	4
PHY 1193	Physics 3	4
PHY 1198	Physics Lab 3	1

Quarter 5

No.	Course	QH
MET 1302	Mechanics B	4
MET 1314	Strss. Anal. A	4
MET 1380	Materials A	4
_____	Soc. Sc./Hm. Electv.	4

Quarter 7

No.	Course	QH
MET 1370	Fluid Mech. A	4
MET 1391	Tech. Lab A or	2
MET 1393	Tech. Lab C	
_____	Tech. Elective	4
_____	Soc. Sc./Hm. Electv.	4
_____	Soc. Sc./Hm. Electv.	4

Specimen Program in Electrical Engineering Technology

First Year

Quarter 1

No.	Course	QH
ENG 1110	Fresh. Eng. 1	4
GET 1170	Engr. Graphics 1	4
MTH 1191	College Algebra	4
PHY 1191	Physics 1	4
PHY 1196	Physics Lab 1	1

Second Year

Third Year

Fourth Year

Quarter 2

No.	Course	QH
ENG 1111	Fresh. Eng. 2	4
GET 1100	Computer Prog. 1	4
MTH 1192	Pre-Calculus	4
PHY 1192	Physics 2	4
PHY 1197	Physics Lab 2	1

Quarter 4

No.	Course	QH
ECN 1115	Prin. of Macroecon.	4
EET 1151	Circ. Analys. 1	4
MTH 1194	Calculus 2	4
_____	Soc. Sc./Hm. Electv.	4

Quarter 6

No.	Course	QH
EET 1125	Circuit Lab 2	2
EET 1311	Electronics 1	4
EET 1353	Circ. Analys. 3	4
EET 1360	Engr. Analys. 1	4
SPC ____	Spch./Com. Electv.	4

Quarter 8

No.	Course	QH
EET 1313	Electronics 3	4
EET 1327	Adv. Elec. Lab 1	2
EET 1330	Energy Conversion	4
_____	Tech. Elective	4
_____	Soc. Sc./Hm. Electv.	4

Quarter 3

No.	Course	QH
ENG 1114	Fresh. Tech. Writ.	4
GET 1171	Engr. Graph. 2	4
MTH 1193	Calculus 1	4
PHY 1193	Physics 3	4
PHY 1198	Physics Lab 3	1

Quarter 5

No.	Course	QH
EET 1124	Circuit Lab 1	2
EET 1152	Circ. Analys. 2	4
MET 1319	Mechanics	4
MTH 1195	Calculus 3	4
_____	Soc. Sc./Hm. Electv.	4

Quarter 7

No.	Course	QH
EET 1310	Electrical Measure.	4
EET 1312	Electronics 2	4
EET 1323	Electrical Lab	2
EET 1354	Circ. Analys. 4	4
ENG 1340	Writing Workshop	1

Quarter 9

No.	Course	QH
EET 1314	Pulse & Digital 1	4
EET 1328	Adv. Elec. Lab 2	2
EET 1337	Distributed Systems	4
_____	Technical Elective	4
_____	Soc. Sc./Hm. Electv.	4

Fifth Year**Technical electives must be chosen from:**

No.	Course	QH
CHT 1381	Nuclear Technology	4
CT 1311	C Language	4
EET 1315	Pulse & Digital 2	4
EET 1317	Communication Sys. 1	4
EET 1318	Communication Sys. 2	4
EET 1319	Communication Sys. 3	4

Quarter 10

No.	Course	QH
EET 1329	Adv. Elec. Lab 3	2
EET 1370	Digital Cmptrs. 1	4
EET 1377	Control Engr. 1	4
_____	Tech. Elective	4
_____	Open Elective*	4

Quarter 11

No.	Course	QH
EET 1371	Digital Computers 2	4
EET 1378	Control Engr. 2	4
_____	Technical Elective	4
_____	Soc. Sc./Hm. Elctv.	4

* No Phys. Ed., ROTC, or remedial.

Specimen Program in Mechanical Engineering Technology**First Year****Quarter 1**

No.	Course	QH
ENG 1110	Fresh. Eng. 1	4
GET 1170	Engr. Graphics. 1 or	4
GET 1100	Computer Prog. 1	4
MTH 1191	College Algebra	4
PHY 1191	Physics 1	4
PHY 1196	Physics Lab 1	1

Quarter 2

No.	Course	QH
ENG 1111	Fresh. Eng. 2	4
GET 1110	Computer 1 or	4
GET 1170	Engr. Graphics 1	4
MTH 1192	Pre-Calculus	4
PHY 1192	Physics 2	4
PHY 1197	Physics Lab 2	1

Quarter 3

No.	Course	QH
ENG 1114	Fresh. Tech. Writ.	4
GET 1171	Engr. Graphics 2	4
MTH 1193	Calculus 1	4
PHY 1193	Physics 3	4
PHY 1198	Physics Lab 3	1

Second Year**Quarter 4**

No.	Course	QH
EET 1320	Elec./Electronics	4
GET 1364	Kinematics	4
MET 1301	Mechanics A	4
MTH 1194	Calculus 2	4

Quarter 5

No.	Course	QH
CHM 1130	Chemistry 1	4
CHM 1138	Chem. Lab	1
MET 1302	Mechanics B	4
MET 1314	Stress Analysis A	4
MTH 1195	Calculus 3	4

Third Year**Quarter 6**

No.	Course	QH
ECN 1115	Prin. of Macroecon.	4
ENG 1340	Writ. Wkshp.	1
MET 1303	Mechanics C	4
MET 1315	Stress Analysis B	4
MET 1340	Thermo A.	4
MET 1390	Meas. Lab	2

Quarter 7

No.	Course	QH
MET 1341	Thermo B	4
MET 1370	Fluid Mechanics A	4
MET 1380	Materials A	4
MET 1391	Tech. Lab A	2
_____	Soc. Sc./Hm. Elctv.	4

Fourth Year**Quarter 8**

No.	Course	QH
MET 1330	Mech. Des. A	4
MET 1371	Fluid Mechanics B	4
MET 1392	Tech. Lab B	2
MET 1396	Machine Shop or	4
IIS _____	Elective	
_____	Soc. Sc./Hm. Elctv.	4

Quarter 9

No.	Course	QH
MET 1331	Mech. Des. B	4
MET 1343	Heat Transfer	4
MET 1393	Tech. Lab C	2
_____	Soc. Sc./Hm. Elctv.	4
_____	Technical Elective	4

Fifth Year**Quarter 10**

No.	Course	QH
MET 1366	Eng. Economy	4
MET 1394	Tech. Lab D	2
MET 1481	Materials B or	4
MET 1416	Stress Analysis C	
_____	Soc. Sc./Hm. Electv.	4
_____	Technical Elec.	4

Quarter 11

No.	Course	QH
MET 1342	Ref. & Air Cond.	
MET 1395	Tech. Lab E	2
_____	Open Elective*	4
_____	Soc. Sc./Hm. Electv.	4

Technical electives must be chosen from:

No.	Course	QH
MET 1414	Mech. Vibrations	4
MET 1415	Exp. Stress Analysis	4
MET 1416	Stress Analysis C	4
MET 1444	Power Generation	4
MET 1481	Materials B	4

No.	Course	QH
CHT 1381	Nuclear Technology	4
EET 1321	Elec./Electronics 2	4
EET 1390	Optical Instrumentation	4
MTH 1196	Differential Equats.	4

*No Phys. Ed, ROTC, or remedial.

Specimen Program in Computer Technology**First Year****Quarter 1**

No.	Course	QH
ENG 1110	Fresh. Eng. 1	4
GET 1170	Engr. Graphics 1	4
MTH 1191	College Algebra	4
PHY 1191	Physics 1	4
PHY 1196	Physics Lab 1	1

Quarter 2

No.	Course	QH
CT 1105	Intro. to Prog.	4
ENG 1111	Fresh. Engr. 2	4
MTH 1192	Pre-Calculus	4
PHY 1192	Physics 2	4
PHY 1197	Physics Lab 2	1

Quarter 3

No.	Course	QH
CT 1150	Basic Comp. Organ.	4
ENG 1114	Fresh. Tech. Writ.	4
MTH 1193	Calculus 1	4
PHY 1193	Physics 3	4
PHY 1198	Physics Lab 3	1

Second Year**Quarter 4**

No.	Course	QH
CT 1310	FORTTRAN	4
ECN 1115	Economics 1	4
EET 1151	Circs. Analysis. 1	4
MTH 1194	Calculus 2	4

Quarter 5

No.	Course	QH
CT 1311	"C" Language	4
EET 1152	Circuits Analysis 2	4
MTH 1195	Calculus 3	4
_____	Soc. Sc./Hm. Electv.	4

Third Year**Quarter 6**

No.	Course	QH
CT 1340	Mod. Prog. Tech.	4
CT 1335	Num. Methods	4
CT 1345	Assembly Lang.	4
EET 1311	Electronics 1	4
ENG 1340	Writing Workshop	1

Quarter 7

No.	Course	QH
CT 1330	Data Structures	4
CT 1368	Semicond. Logic	4
CT 1374	Intro. to CPU Hdwre.	4
_____	Soc. Sci./Hum. Elect.	4

Fourth Year**Quarter 8**

No.	Course	QH
CT 1335	Num. Methods	4
CT 1369	Comp. Logic	4
CT 1375	CPU Hdwre. Arch.	4
CT _____	Comp. Tech. Elec.	4
_____	Soc. Sci./Hum. Electv.	4

Quarter 9

No.	Course	QH
CT 1355	Micro-Per. Hardware	4
CT 1380	Data Comm. Methods	4
CT _____	Comp. Tech. Elective	4
_____	Tech Elective	4

Fifth Year**Quarter 10**

No.	Course	QH
CT 1356	Cmplx. Per. Hdw.	4
CT 1360	Industry Software	4
CT _____	Comp. Tech. Elec.	4
_____	Soc. Sc./Hm. Electv.	4

Quarter 11

No.	Course	QH
CT 1351	Adv. Comp. Organ.	4
CT 1365	Industry Hardware	4
_____	Technical Elec.	4
_____	Soc. Sc./Hm. Electv.	4

College of Nursing

Specimen Program for Baccalaureate Degree in Nursing

First Year

Quarter 1

No.	Course	QH
BIO 1115	Human Biology	4
ENG 1100	Fresh. Eng. 1	4
MTH 1106	Fund. of Math	4
NUR 1100	Nursing	4

Second Year

Quarter 2

No.	Course	QH
BIO 1152	Anat. & Phys. 1	4
CHM 1111	Gen. Chem.	5
ENG 1111	Fresh. Eng. 2	4
NUR 1101	Nursing	4

Quarter 4

No.	Course	QH
BIO 1120	Bas. Microbiol.	4
BIO 1154	Anat. & Phys. 3	4
NUR 1200	Nursing/Human Needs 1	6
PSY 1111	Fnd. Psych. 1	4

Quarter 6

No.	Course	QH
NUR 1300	Nursing/Common Problems	7
NUR 1302	Nur. Trans. (R.N. only)	9
PSY 1241	Behavior & Dev. 1	4
PCL 1305	Pharmacology	3
SOA 1100	Peoples & Cultures	4

Quarter 8

No.	Course	QH
NUR 1401	Med. Surg. Nursing	9
_____	Hum. Elective	4
_____	Elective	4

Quarter 10

No.	Course	QH
NUR 1500	Com. Hlth. Nur.	9
_____	Elective	4
_____	Elective	4

Quarter 3

No.	Course	QH
BIO 1153	Anat. & Phys. 2	4
CHM 1112	Gen. Chem.	5
NUR 1102	Hum. Nutrition	4
SOC 1100	Sociology	4

Quarter 5

No.	Course	QH
NUR 1201	Nursing/Human Needs 2	6
NUR 1202	Intro. Pathophys. Concepts	4
PSY 1112	Fnd. Psych. 2	4
_____	Computer Elect.	4

Quarter 7

No.	Course	QH
ENG 1350	Interm. Writing	4
NUR 1301	Psych. Nursing	7
PSY 1242	Behavior & Dev. 2	4

Quarter 9

No.	Course	QH
NUR 1400	Mat. Child Nur.	9
_____	Hum. Elective	4
_____	History Elective	4

Quarter 11

No.	Course	QH
NUR 1501	Contemp. Nur.	5
NUR 1502	Intro. Nur. Res.	4
_____	Elective (if desired)	4

Third Year

Fourth Year

Fifth Year

177 QH = Minimum graduation requirement.

Degrees

The College of Nursing offers a five-year program leading to the Bachelor of Science in Nursing. The program is open to registered nurses in both day and evening sections. Students eligible for advanced placement may complete the program in less than five years.

Quantitative Requirements

Candidates for the bachelor of science degree must successfully complete all of the prescribed courses in the applicable curriculum. For the bachelor of science degree this totals 177 quarter hours. The prescribed periods of cooperative work at health agencies associated with the University are not required of the registered nurses.

College of Pharmacy and Allied Health Professions

Specimen Program in Pharmacy (Five-Year Cooperative)

First Year

Quarter 1

No.	Course	QH
BIO 1106	General Biology	4
CHM 1111	General Chemistry	5
MTH 1106	Fund. Math.* <i>or</i>	4
MTH 1107	Func. & Bas. Cal.*	4
PHP 1100	Prof. of Pharm.	1
_____	A. & S. Electives	4

Quarter 2

No.	Course	QH
BIO 1107	Animal Biology	4
ENG 1110	Fresh. English 1	4
MTH 1107	Func. & Bas. Cal.*	4
_____	<i>or</i>	
MTH 1108	Calculus*	4
PAH 1135	Prof. Dynamics in Hlth. Care Delivery	4

Quarter 3

No.	Course	QH
CHM 1122	General Chemistry	5
ENG 1111	Fresh. English 2	4
_____	A. & S. Elective	4
_____	<i>or</i>	
MTH 1108	Calculus	4
_____	A & S Elective	4

Second Year

Quarter 4 (Entire Class) (Sept.-Dec.)

No.	Course	QH
CHM 1268	Organic Chemistry 1	5
PCT 1240	Pharm. Calculations	4
PHY 1201	Physics 1	4
_____	A. & S. Elective	4

Quarter 4A (Entire Class) (Jan.-March)

No.	Course	QH
CHM 1269	Organic Chemistry 2	5
PAH 1202	Anat. & Physiology	5
_____	A. & S. Elective	4
PHY 1203	Physics 3	4

Quarter 5 (April-June & June-Sept.)

No.	Course	QH
PAH 1204	Anat. & Physiology 2	5
PAH 1280	Biochemistry	5
PHP 1303	Interpersonal Skills for Health Prof.	4
_____	A. & S. Elective	4

Third Year

Quarter 6

No.	Course	QH
PCL 1410	Pathology	4
PCT 1310	Pharmaceutics Lab	1
PCT 1340	Pharmaceutics 1	4
PMC 1321	Phrm. Anl. & Q.C.	4
PMC 1419	Med. Chm./Pharm. 1	5

Quarter 7

No.	Course	QH
ENG 1340	Writing Workshop	1
PCL 1420	Pharm. Med./Chem. 2	6
PCL 1451	Pharmacology Lab	1
PCT 1320	Pharmaceutics Lab 2	2
PCT 1350	Pharmaceutics 2	5
PHP 1304	Social Psychology	4

Fourth Year

Quarter 8

No.	Course	QH
INT 1100	Beg. Computer Use	4
PCL 1422	Med./Chm. Phm. 3	6
PCT 1440	Biopharm./ Pharmacokinetics	4
PMC 1420	Anti-infectives	5

Quarter 9 (Entire Class) (April-June)

No.	Course	QH
PCT 1441	Phrmcoknetc. Prin. in Drug Therapy	4
PHP 1401	Drug Info. & Eval.	3
PHP 1402	Parapharmaceuticals	2
PHP 1601	Non-Presc. Med.	4
PHP 1602	Pharmaco- therapeutics	5

Fifth Year

Quarter 10 (Summer)

No.	Course	QH
PHP 1302	Phrm. Admin. 1	4
PHP 1503	Prof. Prac. Lab 1	1
_____	Prof. Elective	4
_____	A. & S. Elect.	8
_____	<i>or</i>	
PHP 1501	Phrm. Extnrshp. <i>or</i>	4
PHP 1502	Clin. Pharmacy	15

Quarter 11 (Fall)

No.	Course	QH
PHP 1301	Ph. Juris.	4
PHP 1305	Hosp. Phrm. Mgmt.	4
_____	<i>or</i>	
PHP 1306	Com. Phrm. Mgt.	4
TOX 1300	Toxicology	4
_____	Prof. Elective	4
_____	<i>or</i>	
PHP 1501	Phrm. Extnrshp. <i>or</i>	4
PHP 1502	Clin. Pharmacy	15

**Quarter 12
(Winter)**

No.	Course	QH
PHP 1302	Phrm. Admin. 1	4
PHP 1503	Prof. Prac. Lab 1	1
_____	Prof. Elective	4
_____	A. & S. Elect.	8
_____	or	
PHP 1501	Phrm. Extnrshp. or	4
PHP 1502	Clin. Pharmacy	15

**Quarter 13
(Spring)**

No.	Course	QH
PHP 1301	Ph. Juris	4
PHP 1305	Hosp. Phrm. Mgmt.	4
_____	or	
PHP 1306	Com. Phrm. Mgt.	4
TOX 1300	Toxicology	4
_____	Prof. Elective	4
_____	or	
PHP 1501	Phrm. Extnrshp. or	4
PHP 1502	Clin. Pharmacy	15

*Minimum math requirement: MTH 1108.

Notes: About one quarter of the class will be in PHP 1502, one quarter in PHP 1501, and one half in the classroom for each quarter. Students must take a total of 8 credits for professional electives. All 8 credits may be taken in one quarter or as outlined above.

English 1340 Writing Workshop—Upper-division writing requirement can be filled by taking English 1340 upon completion of 80 QH beginning with the class of 1989.

Specimen Program in Dental Hygiene (BS)

Students are admitted directly to the Forsyth School for Dental Hygienists and should contact the school for catalogs, applications, and complete program information by writing to: Forsyth School for Dental Hygienists, 140 The Fenway, Boston, Massachusetts 02115.

First Year

Quarter 1

No.	Course	QH
BIO 1106	General Biology	4
ENG 1110	Fresh. English 1	4
MTH 1106	Fund. Math	4
PSY 1111	Fund. Psych. 1	4
_____	Prof. Course	1

Quarter 2

No.	Course	QH
BIO 1107	Animal Biology	4
CHM 1111	General Chemistry	5
MTH 1107	Func. & Bas. Calculus	4
PAH 1135	Prof. Dyn. in Hlth.	4
_____	Care Delivery	
_____	Prof. Course	2

Quarter 3

No.	Course	QH
BIO 1120	Bas. Microbio.	4
CHM 1112	General Chemistry	5
ENG 1111	Fresh. English 2	4
SOC 1100	Intro. Soc.	4
_____	Prof. Course	2

Second Year

Quarter 4

No.	Course	QH
PAH 1203	Anat. & Physiology 1	5
_____	Prof. Courses	10
_____	Elective	4

Quarter 5

No.	Course	QH
PAH 1204	Anat. & Physiology 2	5
_____	Prof. Courses	9
_____	Elective	4

Quarter 6

No.	Course	QH
PHP 1303	Inter. Skills	4
_____	Prof. Courses	12

Third Year

Quarter 7

No.	Course	QH
MTH 1152	Stat. Think.	4
_____	Prof. Courses	12

Quarter 8

No.	Course	QH
_____	Prof. Courses	11
_____	Elective	4

Quarter 9

No.	Course	QH
_____	Prof. Courses	11
_____	Elective	4

Fourth Year

Quarter 10

No.	Course	QH
ENG 1380	Eng. Writing	4
_____	Prof. Courses	11
_____	Prof. Elective	4

Quarter 11

No.	Course	QH
_____	Prof. Courses	6
_____	Prof. Elective	4
_____	Elective	4

Quarter 12

No.	Course	QH
_____	Prof. Courses	4
_____	Prof. Elective	8
_____	Elective	4

Specimen Program in Dental Hygiene (AS)

First Year

Quarter 1

No.	Course	QH
BIO 1150	Anat. & Phys. 1	5
CHM 1101	General Chemistry	4
_____	Prof. Courses	12

Quarter 2

No.	Course	QH
BIO 1151	Anat. & Phys. 2	5
CHM 1102	General Chemistry	4
_____	Prof. Courses	9

Quarter 3

No.	Course	QH
BIO 1120	Microbio.	4
_____	Prof. Courses	12

Second Year**Quarter 4**

No.	Course	QH
ENG 1110	Fresh. English 1	4
	Prof. Courses	12

Quarter 5

No.	Course	QH
PSY 1111	Fnd. Psych. 1	4
	Prof. Courses	11

Quarter 6

No.	Course	QH
ENG 1111	Fresh. English 2	4
SOC 1100	Intro Soc.	4
	Prof. Courses	11

Specimen Program in Medical Laboratory Science (Five-Year Cooperative)

First Year**Quarter 1**

No.	Course	QH
BIO 1106	Gen. Bio.	4
ENG 1110	Fresh. Eng. 1	4
MLS 1101	MLS Orient. 1	1
MTH 1106	Fund. Math. <i>or</i>	4
MTH 1107	Func. Calculus	4
	Elective	4

Quarter 2

No.	Course	QH
BIO 1107	Anim. Bio.	4
CHM 1111	Gen. Chem. 2	5
MLS 1102	MLS Orient. 2	1
PAH 1135	Prof. Dyn.	4
	Comp. Sci. Elective	4

Quarter 3

No.	Course	QH
CHM 1122	Gen. Chem. 2	5
ENG 1111	Fresh. Eng. 2	4
MLS 1112	Urinalysis	2
MLS 1212	UA Lab	1
	Elective	4

Second Year**Quarter 4
Entire Class**

No.	Course	QH
BIO 1253	Humn. Physio. 1	4
CHM 1264	Org. Chem. 1*	5
MLS 1123	Heme. 1	2
MLS 1124	Heme. 2	2
MLS 1171	Basic Immuno.	1
MLS 1223	Heme. Lab	2
MLS 1271	Immuno. Lab	1

**Quarter 4A
Entire Class**

No.	Course	QH
MLS 1132	Immunohem.	3
MLS 1142	Microbio. 1	3
MLS 1152	Clin. Chem.	4
MLS 1232	Immunoh. Lab	1
MLS 1242	Microbio. 1 Lab	1
MLS 1252	Clin. Chem. Lab	1
	Elective	4

Quarter 5

No.	Course	QH
BIO 1254	Humn. Physio. 2	4
CHM 1265	Organic Chem. 2*	5
MLS 1143	Microbio. 2	2
MLS 1243	Microbio. 2 Lab	1
MLS 1641	Parasitology	2
MLS 1644	Parasit. Lab	1
	Elective	4

Third Year**Quarter 6**

No.	Course	QH
BIO 1260	Genet. & Devel.	4
MLS 1672	Immunopath.	3
PHY 1201	Physics 1	4
PHY 1501	Physics Lab	1
	Statistics	4
	Elective	4

Quarter 7

No.	Course	QH
BIO 1261	Cell Phys. Bio.	4
ENG 1340	Writing Wkshp.*	1
MLS 1654	Adv. Chem. 1	4
PHY 1202	Physics 2	4
PHY 1502	Physics Lab	1
	Elective	4

*A.S. program (MLT) includes 12 QH of clinical applied study during two quarters of the third year.

Fourth Year**Quarter 8**

No.	Course	QH
MLS 1621	Adv. Hem. 1	3
MLS 1622	Adv. Hemostasis	4
MLS 1631	Adv. Immunohem.	2
MLS 1648	Adv. Microbio.	4
MLS 1655	Adv. Chem. 2	4

Quarter 9

No.	Course	QH
	(Clinical Appl. Study)	
MLS 1532	Immunohema AS <i>or</i>	3
MLS 1552	Clin. Chem. AS	7
MLS 1573	Immuno. 1 AS	1

Fifth Year**Quarter 10**

No.	Course	QH
MLS 1523	Hematology AS <i>and</i>	4
MLS 1544	Clin. Micro. AS <i>or</i>	7
MLS 1574	Immuno. 2 AS	1
MLS 1890	U/G Research	2
	(optional)	

Quarter 11

No.	Course	QH
MLS 1665	Med. Lab Mgmt.	2
MLS 1661	MLS Education	2
MLS 1662	Clinimetrics	2
MLS 1681	MLS Sen. Sem.	2
	Electives	8

*CHM 1268 and CHM 1269 may be substituted for CHM 1264 and CHM 1265.

*Upper-division writing requirement can be filled by taking ENG 1340 upon completing 80 QH or substituting a suitable 4 QH writing course.

Elective Distribution Requirements

12 QH of Humanities

8 QH of Social Sciences; 4 QH Prof. Dynamics

16–28 QH of Free Electives; including one computer science and one statistics course.

Specimen Program in Health Record Administration (Five-Year Cooperative)

First Year

Quarter 1

No.	Course	QH
BIO 1106	Gen. Bio.	4
ENG 1110	Fresh. Eng. 1	4
HRA 1100	Orient. Med. Rec. 1	1
MTH 1101	Bas. Math*	4
PSY 1111	Fnd. Psych. 1	4

Quarter 2

No.	Course	QH
BIO 1107	Anim. Bio.	4
MTH 1103	Bas. Math.*	4
PAH 1135	Dynam. of Hlth. Care	4
_____	A. & S. Elective	4

Quarter 3

No.	Course	QH
BIO 1121	Intro. Microbio.	3
ENG 1111	Fresh. Eng. 2	4
PSY 1112	Fnd. Psych. 2	4
_____	A. & S. Elective	4

Second Year

Quarter 4

No.	Course	QH
BIO 1150	Hu. Anat. 1	5
HRA 1321	Lang. Hlth. Prof.	2
SOC 1100	Intro. Socio. or	4
SOA 1100	Anthropology	_____
_____	A. & S. Elective	4
_____	Elective	4

Quarter 5

No.	Course	QH
BIO 1151	Hum. Anat. 2	5
MTH 1150	Prob. Stat. & Comp.	4
SPC 1115	In Comm Skills	4
_____	A. & S. Elective	4

Third Year

Quarter 6

No.	Course	QH
HRA 1310	Hosp. Law	2
HRA 1320	Lang. of Medicine	4
HRA 1330	Fnd. Med. Sci. 1	3
HRA 1410	Hlth. Rec. Sci. 1	4
_____	Elective	4

Quarter 7

No.	Course	QH
ENG 1340	Writing Workshop	1
HRA 1340	Fnd. Med. Sci. 2	3
HRA 1420	Hlth. Rec. Sci. 2	4
HRM 1432	Organizational Behav.	4
INT 1100	Begin. Computer Use	4

Fourth Year

Quarter 8

No.	Course	QH
HRA 1430	Hlth. Rec. Sc. 3	4
HRA 1450	Appl. Hlth. Rec. Dir. Pract. I	3
HRA 1510	Mgt. Hlth. Rec. Serv. 1	4
HRA 1580	Train. & Develop.	2
HRA 1610	Intro. DP for Health Sci.	4

Quarter 9

No.	Course	QH
HRA 1440	Hlth. Rec. Sci. 4	4
HRA 1460	Appl. Hlth. Rec. Dir. Pract. 2 (7 days)	2
HRA 1520	Mngt. of Hlth. Rec. Service 2	4
HRA 1540	Qual. Assur.	4
HRA 1630	Intro. Hlth. Data Res.	4

Fifth Year

Quarter 10

No.	Course	QH
HRA 1530	Mgmt. of Hlth. Rec. Service 3	4
HRA 1620	Sys. Analysis	4
HRA 1640	Med. Comp. Appl.	4
_____	Elective	4

Quarter 11

No.	Course	QH
HRA 1471	Appl. Hlth. Rec. Sc. 3	3
HRA 1560	Sem. Hlth. Rec.	2
HRA 1570	Hlth. Rec. Prof.	2
HRA 1800	Indep. Study	4
HRA 1820	Special Topics 2	2

*Students may substitute MTH 1106 (4 QH) and 4QH Elective for MTH 1101 and MTH 1103.

HRA 1810 Special Topics 1, 2 QH.

HRA 1820 Special Topics 2, 2 QH.

Assigned by program director.

English 1340 Writing Workshop—Upper-division writing requirement can be filled by taking English 1340 upon completion of 80 QH beginning with the class of 1989.

Specimen Program in Respiratory Therapy BS (Five-Year Cooperative)

First Year

Quarter 1

No.	Course	QH
BIO 1140	Bas. Ani. Bio.	4
CHM 1111	Gen. Chem.	5
ENG 1110	Fresh. Eng. 1	4
PSY 1111	Fund. of Psych.	4
RTH 1111	Resp. Ther. Sem. 1	1

Quarter 2

No.	Course	QH
BIO 1141	Bas. Ani. Bio. 2	4
MTH 1106	Fund. Math	4
PAH 1135	Prof. Dynmics. in the Hlth. Care Deliv. Sys.	4
RTH 1112	Resp. Ther. Sem. 2	1
_____	A. & S. Elective	4

Quarter 3

No.	Course	QH
BIO 1120	Microbio.	4
CHM 1122	Gen. Chem.	5
ENG 1111	Fresh. Eng. 2	4
MTH 1107	Func. & Bas. Calc.	4
RTH 1113	Resp. Ther. Sem. 3	1

Second Year**Quarter 4**

No.	Course	QH
PAH 1202	Anat. Physiol. 1	5
PSY 1209	Basic Physics	4
RTH 1301	Prof. Prac. Lab 1	1
RTH 1331	Patient Care	4
_____	A. & S. Elective	4

Quarter 5

No.	Course	QH
PCL 1309	Pharmacology	4
PHY 1204	Anat. & Physiology	5
RTH 1211	Pract. in Resp. Care	4
RTH 1302	Prof. Pract. Lab 2	1
RTH 1332	Intro. to Resp. Care	4

Third Year**Quarter 6**

No.	Course	QH
RTH 1312	Practicum in Resp. Care	4
RTH 1320	Cardiopul. Physiology	4
RTH 1403	Prof. Practice Lab 3	1
RTH 1414	Clinical Seminar 1	1
RTH 1433	RC for Med-Surg. Pts.	4
RTH 1435	Intro. to Ped. RC	2

Quarter 7

No.	Course	QH
ENG 1340	Writing Workshop	1
RTH 1313	Practicum in Resp. Care 3	6
RTH 1321	Cardiopul. Disease	4
RTH 1404	Prof. Practice Lab 4	1
RTH 1415	Clinical Seminar 2	1
RTH 1434	RC for Critical Pts.	4

Fourth Year**Quarter 8**

No.	Course	QH
PCL 1410	Pathology	4
PHL 1165	Moral Problems in Med.	4
RTH 1505	Cardiopul. Lab Practice	1
RTH 1573	Cardiopul. Lab Technology	4
_____	Computer Elective	4

Quarter 9

No.	Course	QH
RTH 1576	Neonatal Resp. Care	4
_____	A. & S. Elective	4
_____	A. & S. Elective	4
_____	Computer Elective	4

Fifth Year**Quarter 10**

No.	Course	QH
RTH 1578	Adv. Med. Monitoring	4
_____	A. & S. Elective	4
_____	Professional Elective	4
_____	Professional Elective	4

Quarter 11

No.	Course	QH
RTH 1574	Adv. Clin. Physiology	4
_____	A. & S. Elective	4
_____	Professional Elective	4
_____	Professional Elective	4

English 1340 Writing Workshop—Upper-division writing requirement can be filled by taking English 1340 upon completion of 80 QH beginning with the class of 1989.

Specimen Program in Toxicology (Five-Year Cooperative)

First Year**Quarter 1**

No.	Course	QH
BIO 1106	Biology 1	4
ENG 1110	English 1	4
MTH 1107	Fund Math	4
TOX 1100	Tox Ori	1
_____	A&S Elective	4

Quarter 2

No.	Course	QH
CHM 1111	Gen Chem 1	5
ENG 1111	English 2	4
PAH 1135	Prof Dynamics in Hlth. Care Deliv. Sys.	4
PHY 1201	Physics 1	4

Quarter 3

No.	Course	QH
BIO 1107	Biology 2	4
CHM 1122	Chemistry 2	5
MTH 1108	Calculus	4
_____	A&S Elective	4

Second Year**Quarter 4**

No.	Course	QH
CHM 1264	Org Chem 1	5
MTH 1150	Math Probs/Stats or	4
PSY 1211	Stats in Beh Sci 1	4
PAH 1202	A&P 1	5
PHY 1203	Physics 3	4

Quarter 5

No.	Course	QH
CHM 1265	Org Chem 2	5
PAH 1204	A&P 2	5
_____	A&S. Elective	4

Third Year**Quarter 6**

No.	Course	QH
PAH 1280	Biochemistry	5
PCL 1410	Pathology	4
PMC 1418	Med Chem/Pharm 1	4
_____	A&S Elective	4

Quarter 7

No.	Course	QH
ENG 1340	Eng Writing Workshop	1
MLS 1151	Clin Chem	5
PCL 1451	Pharm Lab	1
PCL 1420	Pharm/Med Chem 2	6
TOX 1300	Toxicology 1	4

Fourth Year**Quarter 8**

No.	Course	QH
CHM 1221	Anal. Chem. <i>or</i>	4
PMC 1321	Pharm. Anal.	4
PCL 1422	Pharmacol. Med. Chem. 3	6
TOX 1322	Biochem. Tox.	4
	A.&S. Elective	4

Quarter 9

No.	Course	QH
BIO 1120	Microbiology	4
BIO 1261	Cell Physiology	4
TOX 1301	Toxicology 2	4
	A.&S. Elective	4

Fifth Year**Quarter 10**

No.	Course	QH
CHM 1431	Inst. Analysis	5
CHM 1461	Id. Org. Comp.	3
PCT 1440	Bio. Pharm./Pharm. Elective	4

Quarter 11

No.	Course	QH
HSL 1506	Comm. Health	4
MLS 1341	Epidemiology	3
TOX 1302	Toxicology 3	4
	A.&S. Elective(s)	4-8

English 1340 Writing Workshop—Upper-division writing requirement can be filled by taking English 1340 upon completion of 80 QH beginning with the class of 1989.

University College Alternative Freshman-Year Program

Business Track: One-Year Program**Quarter 1**

No.	Course	QH
ED 4003	Int. Language Skills Dev. A	4
ENG 4013	Fund. of Eng. 1	4
HST 4110	Hist. Civ. A <i>or</i> Business Req.*	4
MTH 1000	Math 1†	4

Quarter 2

No.	Course	QH
ED 4004	Int. Language Skills Dev. B	4
ENG 4014	Fund. of English 2	4
HST 4110	Hist. Civ. A <i>or</i> Business Req.*	4
MTH 1010	Math 2†	4

Quarter 3

No.	Course	QH
ECN 4601	Economics 1 <i>or</i> Directed Elective‡	4
HST 4111	Hist. of Civ. B	4
MGT 4110	Survey of Bus. <i>or</i> Directed Elective‡	4
MTH 1113	Math for Bus.†	4

Note: January admission: same courses offered winter, spring, and summer quarters.

Criminal Justice, Education, or Arts and Sciences Track: One-Year Program**Quarter 1**

No.	Course	QH
ED 4003	Int. Language Skills Dev. A	4
ENG 4013	Fund. of Eng. 1	4
MTH 1000	Math 1*	4
SOC 4010	Sociology 1 <i>or</i> Directed Elective‡	4

Quarter 2

No.	Course	QH
ED 4004	Int. Language Skills Dev. B	4
ENG 4014	Fund. of English 2	4
HST 4110	Hist. Civ. A <i>or</i> Directed Elective‡	4
MTH 1010	Math 2 <i>or</i>	
SOC 4011	Sociology 2	4

Quarter 3

No.	Course	QH
ENG 1111	Freshman Eng. 2 <i>or</i> Directed Elective‡	4
HST 4111	Hist. of Civ. B	4
POL 4106	Intro. to Politics	4
SOC 4011	Sociology 2 <i>or</i> Elective	4

Health Sciences Track**Quarter 1**

No.	Course	QH
CHM 1110	Pre-Chemistry	5
ED 4001	Int. Language Skills Dev. 1	2
ENG 4013	Fund. of Eng. 1	4
MTH 1010	Math. 2	4

Quarter 2

No.	Course	QH
CHM 1111	Gen. Chem. 1	5
ED 4002	Int. Language Skills Dev. 2	2
ENG 4014	Fund. of English 2	4
MTH 1106	Fund. of Math.	4

Quarter 3

No.	Course	QH
BIO 1140	Basic Animal Bio. 1	4
CHM 1112	General Chem. 2	5
ENG 1111	Freshman Eng 2. <i>or</i> Directed Elective‡	4
	Directed Elective	4

Quarter 4

No.	Course	QH
BIO 1141	Basic Animal Bio. 2	4
MTH 1107	Functions & Calc.	4
	Directed Elective	4

*Eligible students may take HST 4110 in Q1 or Q2. Both MGT 4110 and ECN 4601 may be taken in Q1 or Q2 quarter, but must be completed by Q3.

†Mathematics courses will vary depending on placement tests.

‡Directed electives are chosen to help students qualify for major intended.

The Writing Center

The Writing Center offers free assistance to all students on any writing projects. Our trained tutors work one-on-one with writers on class assignments or other writing tasks. The Writing Center staff includes specialists in academic essay writing, technical writing, business writing, research and documentation, editing, grammar, English as a second

language, and literary analysis. Students may either drop in at 102 Cahners Hall, 110 The Fenway, or phone ahead for an appointment, 617-437-3086. Most tutoring sessions last half an hour. Regular Writing Center hours are Monday through Thursday, 10 AM to 4 PM. Some evening hours are available.

Middler Year Writing Requirement

The middler year writing requirement (MYWR) is effective for freshmen who entered the University as of fall 1984 and after and for transfer students who entered as of fall 1985 and after. All middlers (that is, students who have earned 80+ quarter hours including nonco-op students) must complete this graduation requirement at Northeastern. Successful completion of Freshman English is a prerequisite to the MYWR. To complete the middler year writing requirement, students must earn a grade of C (2.0) or better in a four-credit writing course or a pass in a one-credit, pass/fail Writing Workshop.

This University requirement is designed to help students improve their writing for major courses and in their workplaces. The four primary courses are therefore interdisciplinary so that students may write in subjects related to their major.

Students should review the information below. For additional information, students may contact the MYWR Office at 433 Holmes Hall, 617-437-3964.

Middler Year Writing Requirement Courses

Primary MYWR courses.

ENG 1350 Intermediate Writing
ENG 1381 Writing for the Professions:
Business Administration
ENG 1125 Technical Writing
ENG 1340 Writing Workshop

Primary MYWR courses recommended by the following colleges.

College of Arts and Sciences
ENG 1350

Boston-Bouvé College of Human Development Professions
ENG 1350 or ENG 1340

College of Business Administration
ENG 1381

College of Computer Science
ENG 1125

College of Criminal Justice
ENG 1350

College of Engineering
ENG 1125 or ENG 1340

School of Engineering Technology
ENG 1340

College of Nursing
ENG 1350

College of Pharmacy and Allied Health Professions
ENG 1340

Important: Colleges have specific guidelines and schedules for options that apply to majors. Students should consult their dean's office or adviser for guidelines.

Special Note

Classes at Northeastern University are scheduled in different modules.

In assessing quarter weights for courses, the following statement applies: *One quarter-hour of credit is equal to 50 minutes of instruction per week, plus two hours of preparation.*

The Scheduling Office, 126 Hayden Hall, maintains all quarter-hour weights for courses. In the event of error in any publication, the academic record will reflect the correct quarter hours applicable to any degree requirement.

Some course titles may change, but the course number remains the same. Be sure you do not register for a course you may have already taken.

Basic College Compensatory Programs

Basic College Compensatory Programs in mathematics and English are for freshmen native speakers of English whose reading, writing, or mathematical skills need to be strengthened.

The University uses one or more of three criteria to determine which freshmen participate in the compensatory programs: precollege academic credentials, tests administered during orientation week, or performance in ENG 1110, Freshman English 1.

In general, the program consists of six courses, each offering four hours of credit. The courses must fit into the following sequences.

Fall*	
MTH 1000	Mathematical Preliminaries 1
ENG 1110	Freshman English 1†
or	
ENG 1013	Fundamentals of English 1
ED 1003	Reading/Study Skills
Winter*	
MTH 1010	Mathematical Preliminaries 2
ENG 1014	Intensive Writing

Special Notes

Successful completion of Mathematical Preliminaries 1 and 2 is a prerequisite for

MTH 1101, MTH 1106, MTH 1107, and MTH 1108	Nonbusiness mathematics sequence
MTH 1113 and MTH 1114	Business mathematics sequences

A passing letter grade in Freshman English 1 or Intensive Writing is a prerequisite for

ENG 1111	Standard Freshman English 2
ENG 1111–ENG 1113	Engineering sequence
ENG 1111–ENG 1114	Engineering technology sequence

*The same sequence is offered winter/spring for students who enter in January.
†Students whose work in this course is unacceptable for success in ENG 1111, Freshman English 2, will receive a grade of S and must complete ENG 1014, Intensive Writing.

Schedule for Continuation of Compensatory Programming in the Basic Colleges

Acceptance for credit is determined by the faculties of the individual colleges and is therefore subject to change. The chart below outlines the Basic Colleges' policies on compensatory courses. Asterisked (*) courses are graded pass/fail and therefore are not included in the student's quality/point average. A *yes* designates acceptance for credit, a *no* nonacceptance, and an *n/a* not applicable.

	English 1 (ENG 1110/ 1013)	English 2 (ENG 1014)	Mathematical Preliminaries* (MTH 1000)	Mathematical Preliminaries 2* (MTH 1010)	Reading Study Skills (ED 1003)
Arts and Sciences	yes	yes	yes	yes	yes
Bouv�: Physical Therapy	yes	yes	no	no	no
Bouv�: Physical Education	yes	yes	yes	yes	yes
Bouv�: Recreation and Leisure Studies	yes	yes	no	no	no
Bouv�: Teacher Preparations	yes	yes	yes	yes	yes

Business Administration	yes	yes	yes	yes	no
Computer Science†	yes	yes	n/a	n/a	n/a
Criminal Justice	yes	yes	yes‡	yes‡	yes
Engineering†	n/a	n/a	n/a	n/a	n/a
Engineering Technology	yes	yes	n/a	n/a	n/a
Nursing	yes	yes	no	no	no
Pharmacy and Allied Health Professions	yes, but w/o credit§	yes	no	no	no

†This college offers MTH 1120 and MTH 1121, a course sequence in college calculus with algebra and trigonometry, to students who test deficient in mathematics. The sequence involves extra work in algebra and trigonometry and covers the same material as the regular freshman calculus sequences.

‡Students whose diagnostic examinations suggest a need for basic mathematics may elect MTH 1000 or MTH 1010 to prepare for MTH 1106, Fundamentals of Mathematics.

§This college will accept ENG 1110 or ENG 1014 for credit only (with a letter grade). Students who complete English courses must still take a four-credit English elective.



Course Descriptions

Chemical Engineering

The course descriptions listed under chemical engineering are intended to show the general scope of the subject that will be covered. Since courses are continually updated, specific topics or methods of approach may vary from term to term. In addition to meeting course prerequisites, students are expected to take each chemical engineering course in the sequence shown on the specimen program sheet.

CHE 1201 Chemical Engineering Calculations 1 4 QH

Examines the application of fundamental laws of mass and energy conservation to chemical and physical processes. Emphasizes material balances. A corequisite computational lab aids students in improving facility in handling problems typical of the course. Lab fee. *Prereq.* CHM 1132 and CHM 1138. *Take concurrently with CHE 1205.*

CHE 1202 Chemical Engineering Calculations 2 4 QH

Continues CHE 1201, emphasizing energy balances and the simultaneous application of mass and energy conservation laws. Considers typical chemical processing industry problems. *Prereq.* CHE 1201.

CHE 1205 Computation Laboratory 2 QH

Offers lab sessions to aid students in problem formulation and solution. The assignments are based on material presented in CHE 1201. Emphasis is placed on computer software applications. Lab fee. *Prereq.* Taken with CHE 1201.

CHE 1211 Chemical Engineering Thermodynamics 1 4 QH

Topics include the first law and its application to batch and flow systems, heat effects in chemicals, and physical properties of real fluids. Applies basic principles and mathematical relations to the analysis and solution of engineering problems. *Prereq.* CHE 1201 and CHE 1205.

CHE 1300 Chemical Engineering Calculations 2 4 QH

Emphasizes energy balances and the simultaneous application of mass and energy conservation laws in steady and unsteady state processes. Problems are selected from chemical processing industry applications. *Prereq.* CHE 1201 and CHE 1211.

CHE 1310 Chemical Engineering Thermodynamics 2 4 QH

Covers thermodynamic properties of mixtures; fugacity and the fugacity coefficients from equations of state for gaseous mixtures; liquid phase fugacities and activity coefficients for liquid mixtures; phase equilibria; the equilibrium constant for homogeneous gas-phase reactions; and extension of theory to handle simultaneous, heterogeneous, and solution reactions. *Prereq.* CHE 1300.

CHE 1320 Momentum Transport 4 QH

Topics include physical properties of fluids, pipe flow for process application, macroscopic balances and their application, and microscopic balances. *Prereq.* CHE 1211 and CHE 1300.

CHE 1410 Experimental Methods 1 4 QH

Explores an experimental approach to solving chemical engineering problems and preparing reports to detail the results and their interpretations. Presents experiments that illustrate the fundamental unit operations. Lab fee. *Prereq.* CHE 1320.

CHE 1411 Experimental Methods 2 4 QH

Continues CHE 1410, requiring more advanced experimentation and more sophisticated reports. Lab fee. *Prereq.* CHE 1410.

CHE 1421 Chemical Engineering Kinetics 4 QH

Topics include fundamental theories of the rate of chemical change in homogeneous reacting systems; integral and differential analysis of kinetic data; design of batch and continuous-flow chemical reactors; and an introduction to heterogeneous reactions and reactor design. *Prereq.* CHE 1310.

CHE 1430 Heat Transport 4 QH

Examines analytical and numerical integration of heat conduction equations; theoretical and empirical determination of film coefficients of heat transfer; natural convection; heat transfer with phase change; overall coefficient of heat transfer; design of shell-and-tube heat exchangers; and single and multiple effect evaporation. *Prereq.* CHE 1320.

CHE 1440 Separation Processes 4 QH

Covers binary flash distillation; analysis of column distillation through internal stage-by-stage balances; McCabe-Thiele graphical method; Analytical Lewis method; staged column design; packed column design; absorption and stripping; and mass transfer analysis. *Prereq.* CHE 1310.

CHE 1450 Chemical Engineering Economics 4 QH

Introduces financial decision-making techniques as applied to problems of production, storage, transportation, and utilization of chemical resources to meet societal needs. *Prereq.* ECN 1115.

CHE 1501 Process Design 1 6 QH

Focuses on the process design of a chemical plant. Topics include process selection, material and energy balances, equipment selection design, elements of instrumentation, flowsheets, and cost estimates. Lab fee. *Prereq.* CHE 1421 and CHE 1440.

CHE 1502 Process Design 2 6 QH

Continues CHE 1501, requires a more complex design and studies additional elements of process design. Lab fee. *Prereq.* CHE 1501.

CHE 1503 Projects 1 6 QH

Offers individual research related to some phase of chemical engineering. Open only to students selected by the department head on the basis of scholarship and proven ability. Lab fee. *Prereq.* Senior standing and consent of department.

CHE 1504 Projects 2 6 QH

Continues the research work begun in CHE 1503. Lab fee. *Prereq.* CHE 1503.

CHE 1511 Mathematical Methods in Chemical Engineering**4 QH**

Examines the formulation and solution of problems taken from chemical and engineering studies that require advanced mathematical methods. Emphasizes the formulation step, and discusses numeric and analytic solution techniques for solving sets of algebraic equations and for solving ordinary and partial differential equations. *Prereq.* Senior standing.

CHE 1512 Chemical Process Control**4 QH**

Topics include the Laplace transform and its use in solving ordinary differential equations; modeling and computer simulation of basic heat, mass, and fluid-flow dynamics; linearization of nonlinear systems; the transfer function; sensors, transmitters, valves, and controllers; block-diagram algebra; dynamics of higher-order systems; modeling and simulation of control-loop dynamics; frequency response; and Laplace and frequency domain stability analysis. *Prereq.* Senior standing.

CHE 1513 Introduction to Optimization**4 QH**

Demonstrates elementary optimization techniques, such as gradient methods, pattern search, linear programming, and dynamic programming, as applied to a variety of elementary physical and chemical problems. *Prereq.* Senior standing.

CHE 1514 Special Topics**4 QH**

Presents chemical engineering topics of interest to the staff member conducting the class. *Prereq.* Senior standing.

CHE 1516 Mass Transfer Operations**4 QH**

Examines convergence methods applied to bubble and dew-point calculations; equilibrium flash separations; binary and multicomponent batch distillation; binary batch distillation with rectification; McCabe-Thiele method for multiple feeds and side-streams; modified latent heat method in binary distillation; multicomponent distillation, including use of Underwood equations for stage requirement; Fenske-Underwood-Gilliland method for stage requirement; and matrix solution using the theta method of convergence. *Prereq.* Senior standing.

CHE 1517 Analysis of Chemical Processes**4 QH**

Focuses on methods and reactions used for making chemical products on a large scale. Topics include types of physical and chemical equilibria, flow-sheet patterns, energy management, and catalytic and non-catalytic rate problems. Studies a number of situations involving simultaneous application of the above topics in process analyses. *Prereq.* CHE 1300, CHE 1421, and senior standing.

CHE 1518 Management in the Chemical Industries**4 QH**

Focuses on principles of management as applied to the chemical process industries. Uses case studies to supplement lectures. *Prereq.* Senior standing in engineering.

CHE 1519 Kinetics of Polymerization Process**4 QH**

Explores the mechanisms by which polymeric materials are assembled via chemical reaction. Analyzes reaction-rate models based on these mechanisms to investigate the effect of reaction parameters on the chemical and physical structure of the polymeric product. Considers free radical addition, condensation, and ionic polymerization processes. *Prereq.* CHE 1421, CHM 1272, and senior standing.

CHE 1520 Pollution Control in Chemical Industries**4 QH**

Studies fundamental operations for handling environmental problems in the chemical process industries. Discusses water quality requirements and industrial waste characteristics. *Prereq.* Senior standing.

CHE 1521 Chemical Process Development**4 QH**

Traces the manner in which a chemical process evolves from the research lab to full-scale production using typical processes as illustrations. Topics covered include economic factors, safety factors, batch vs. continuous operation, process evaluation, developing the flow sheet, and scale-up considerations. *Prereq.* Senior standing.

CHE 1523 Catalysis**4 QH**

Introduces heterogeneous catalytic processes. Topics include mechanistic explanations, modeling of catalyzed reactions, and the application of catalysts to industrial practice. *Prereq.* Senior standing.

CHE 1530 Biochemical Engineering Fundamentals**4 QH**

Presents key concepts in biochemistry, cell biology, enzyme kinetics, and metabolic pathways, offered as an introductory exposure to these topics and not as complete coverage of life science fundamentals. Topics include biological reactor kinetics and design, transport phenomena in bioprocess systems, and process instrumentation/control. *Prereq.* Open to seniors only.

CHE 1777 Honors Adjunct**1 QH**

To be added to any 4 QH course in the department when approved by the Honors Committee of The College of Engineering. Once approved, the adjunct information is forwarded to the Honors Office for dissemination to the honors membership. Students may enroll in CHE 1777 an unlimited number of times as it can be adjunct to any chemical engineering course.

Civil Engineering

The course descriptions listed under civil engineering are intended to show the general scope of the subject that will be covered. Since courses are continually updated, specific topics or methods of approach may vary from term to term.

CIV 1210 Structural Mechanics 1 4 QH

Topics include statics of particles and rigid bodies in two and three dimensions; analysis of internal forces in trusses and beams; centroids and centers of gravity of lines, area, and volumes; and moments of inertia of areas and masses. *Prereq.* MTH 1227 concurrently and PHY 1222.

CIV 1211 Structural Mechanics 2 4 QH

Surveys analysis of stress and strain; mechanical properties of materials; elastic analysis of stresses and deformations of members subject to axial load, torsion, shear, and moment. Introduces column behavior. *Prereq.* CIV 1210.

CIV 1212 Structural Mechanics 3 4 QH

Continues CIV 1211. Topics include torsion, general bending, curved members, shear flow, shear center, combined stresses including elastic and plastic behavior, continuation of column buckling. Introduces yield and fracture criteria. *Prereq.* CIV 1211.

CIV 1220 Structural Analysis 1 4 QH

Reviews reactions, shear and bending moment diagrams, bar forces in trusses, deflections by virtual work, and moment area methods. Analyzes indeterminate structures by consistent deformations, slope deflection, and moment distribution. *Prereq.* CIV 1211.

CIV 1222 Structural Analysis 2 4 QH

Focuses on matrix analysis of indeterminate structures using both flexibility and stiffness approaches. Examines computer applications to analysis of framed structures. *Prereq.* CIV 1220.

CIV 1224 Structural Analysis 3 4 QH

Continues CIV 1220. Topics include slope deflection; moment distribution; effects of axial loads; symmetry; antisymmetry; nonprismatic members; influence lines for determinate and indeterminate structures, approximate methods of lateral load analysis; and shear wall action. *Prereq.* CIV 1220.

CIV 1226 Structural Analysis and Design Laboratory 2 QH

Uses lectures, experimental studies, computation labs, and computer projects to develop students' knowledge of structural behavior and understanding of the design and analysis of structures. *Prereq.* CIV 1220 taken concurrently.

CIV 1240 Design of Reinforced Concrete Structures 1 4 QH

Reviews mechanical properties of steel and concrete. Studies behavior and design of reinforced concrete beams for shear, moment, and bond; and design of stocky columns for axial load and moment. Emphasizes strength design. *Prereq.* CIV 1220.

CIV 1241 Design of Reinforced Concrete Structures 2 4 QH

Topics include design of slender columns, foundations, and multistory buildings with one-way and two-way floor systems. *Prereq.* CIV 1240.

CIV 1250 Design of Steel Structures 1 4 QH

Focuses on design of steel members subject to tension, compression, bending, and combinations of loading; and design of connections, braced frames, and rigid frames. *Prereq.* CIV 1220.

CIV 1251 Design of Steel Structures 2 4 QH

Topics include design of steel plate girders, composite construction in bridges and buildings, plastic analysis and design, and the design of high-rise buildings subject to lateral loads. *Prereq.* CIV 1250.

CIV 1295 Structural Design Projects 4 QH

Capstone structural design course. Consists of a minimum of two projects that consider environmental, social, and economic impact. Discusses the safety requirements of various government agencies. Projects require identification of design loading, assessment of structural stability, material usage, and the reliability of the proposed design. Employs computer-aided designs and verifies the results by approximate methods. Considers and analyzes economics of alternative designs. *Prereq.* CIV 1222, CIV 1241, CIV 1251; open to seniors only.

CIV 1310 Fluid Mechanics 4 QH

Introduces both the statics and dynamics of fluid mechanics. Topics include properties of fluids; pressure variation in water and air; pressure force on surfaces and submerged bodies, continuity, momentum, and energy principles; dimensional analysis and hydraulic similitude; flow in closed conduits, frictional and local losses in pipes and systems; and problems in steady flow. *Prereq.* CIV 1210.

CIV 1320 Hydraulic Engineering 4 QH

Covers a variety of topics including pipe networks; water hammer; pumps and pump selection; pipe-pump combinations; flow in open channels, uniform flow, gradually varied flow, and hydraulic jump; drag forces on bodies; principles of hydrology, unit hydrograph, and rainfall-runoff relationships; and some aspects of ground water and well hydraulics. *Prereq.* CIV 1310.

CIV 1340 Environmental Engineering 1 4 QH

Focuses on protection and management of the environment. Topics include assessment of environmental quality; introduction to water and wastewater technology; air pollution control; and solid waste management. *Prereq.* CHM 1132.

CIV 1341 Environmental Engineering 2 4 QH

Concentrates on development of fundamental physical, chemical, and biological phenomena of water and wastewater systems with engineering applications in water technology from source to ultimate disposal. *Prereq.* CIV 1310 and CIV 1340.

CIV 1350 Environmental and Hydraulics Laboratory 4 QH

Presents lectures, labs, and field experiments in environmental and hydraulic engineering. Experiments in hydraulics include fluid properties; hydrostatics; drag forces; and flow in pipes, channels, pumps, and turbines. Environmental experiments include physical, chemical, and biological analyses normally used by environmental engineers. Field experiments are coordinated to allow collection of environmental and hydraulic data concurrently. *Prereq.* CIV 1340; CIV 1320 concurrently.

CIV 1370 Air Pollution 4 QH

Focuses on theory and practice related to engineering management of air resources. Surveys microclimate and dispersion of pollutants; atmospheric chemistry; air pollution instrumentation; control of gaseous and particulate emissions; design of air pollution control systems; and biological and chemical aspects of air pollution with emphasis on the toxicological aspects of the environment. Other topics include the physiological effects of aerosols; analysis of organic and inorganic constituents of the atmosphere; and rationale for establishment of air quality criteria and standards. *Prereq.* Seniors only.

CIV 1395 Environmental Design Projects 4 QH

Capstone design course in the field of environmental engineering. Up to six individual design projects are assigned, typically involving water and/or waste treatment, site development, industrial waste handling, chemical treatment, and the modification of existing facilities. Each is given a careful critique. Designs require input relating to environmental protection and impact, economic factors, engineering feasibility, selection from alternatives, and safety consideration. One project requires an oral presentation. *Prereq.* CIV 1320, CIV 1341, CIV 1350, open to seniors only.

CIV 1410 Soil Mechanics 4 QH

Studies soil classification, soil-water phase relations, ground water seepage, consolidation theory, strength properties of soils, stress distributions in soils due to surface loads, and slope stability. *Prereq.* CIV 1211 and CIV 1310.

CIV 1411 Soil Mechanics Laboratory 2 QH

Focuses on lab exercises, including soil classification, seepage, shear strength, consolidation, and triaxial testing. *Prereq.* CIV 1410 taken concurrently.

CIV 1420 Foundation Engineering 4 QH

Topics include subsurface explorations, determination of soil-bearing capacity, design of shallow foundations, pile and caisson foundations, design of retaining walls, anchored bulkheads and braced sheeting, and other selected topics on foundation design and construction. *Prereq.* CIV 1410.

CIV 1430 Geotechnology 4 QH

Introduces the geological sciences as they apply to civil engineering practice. Focuses on the effects of significant geological features on location, design, construction, operation, and maintenance of engineering projects. *Prereq.* Juniors and seniors only.

CIV 1495 Geotechnical Design Projects 4 QH

Capstone design course for those interested in the geotechnical area. Two or more projects involving the various aspects of analysis and design used in geotechnical practice will be done as an individual and/or group effort. The projects will require evaluation of subsurface conditions, identification of critical issues, assessment of environmental impacts, economics, safety, construction sequencing, and construction feasibility. They may also include structural design. Examples include design of foundations for super-structures, temporary earth retaining systems for deep excavations, and permanent earth support walls for deep earthen cuts. *Prereq.* CIV 1420, CIV 1550, open to seniors only.

CIV 1510 Materials 4 QH

Focuses on the structural, chemical, and mechanical properties of materials of importance to civil engineers. Topics include fundamental nature of matter; significance of phase transformations; control of microstructure; and the mechanisms of failure of materials. *Prereq.* CHM 1132.

CIV 1511 Materials Laboratory 2 QH

A lab in which standard tests and equipment are used to determine structural and mechanical properties of materials common to civil engineering practice: concrete, aggregates, steel, wood, asphalt, glass, and others. *Prereq.* Taken concurrently with CIV 1510.

CIV 1530 Transportation Analysis and Planning 4 QH

Covers history and policy issues in urban transportation: characteristics of different urban transportation models; fundamentals of bus and rail transit operations planning; fundamentals of urban highway operation; transportation systems management; and land use and demand modeling. Other topics include environmental impact assessment, citizen participation, data collection, and transportation in developing countries. *Prereq.* Juniors and seniors only.

CIV 1540 Highway Engineering 4 QH

Introduces highway engineering. Topics include administration, economic factors, planning, environmental impacts, geometric design, drainage, and the design of flexible pavements. *Prereq.* CIV 1410 and CIV 1620.

CIV 1550 Construction Management 4 QH

Surveys the construction industry and tasks that must be addressed by construction management, including resource allocation, construction environment, organization, contracts, funding, cash flow, productivity, labor relations, network planning and scheduling, construction accounting, and project control. *Prereq.* Seniors only.

CIV 1595 Transportation Design Projects 4 QH

Capstone design course in transportation. Projects involve planning/design of modified transportation facilities and services. Topics include demand estimation, highway design, traffic flow, safety, economic and social considerations, environmental impacts, and transit fleet size requirements. Examples of such projects are planning for a new highway, transportation systems management planning for an existing corridor, and design of an intermodal transfer facility. *Prereq.* CIV 1530, CIV 1540, CIV 1640, open to seniors only.

CIV 1620 Engineering Measurements 4 QH

Considers the mathematics and instrumentation used in land surveying for obtaining measurements of distance, elevation, and direction. Covers the methodology applied for traverses, areas, coordinate systems, horizontal and vertical curves, earthwork, and topographic mapping. *Prereq.* MTH 1124 and PHY 1222.

CIV 1621 Engineering Measurements Laboratory 2 QH

Examines field problems illustrating and applying the lecture material in CIV 1620, with computer applications. Taken simultaneously with CIV 1620. *Prereq.* GE 1100.

CIV 1625 Civil Computations Laboratory 1 QH

Students will design and execute applications programs for materials covered in CIV 1640 and other courses for a wide variety of civil engineering problems. Some new civil engineering applications topics will also be investigated. *Prereq.* CIV 1640 taken concurrently and GE 1100.

CIV 1630 Civil Engineering Systems 4 QH

Covers application of system synthesis and optimization techniques: calculus method, linear programming, network analysis, and dynamic programming. *Prereq.* MTH 1227.

**CIV 1640 Applied Probability Theory 4 QH
for Civil Engineers**

Topics include applications of probability theory to civil engineering problems, probabilities of events, random variables and distributions, derived distributions, expectation, common probability models, and an introduction to statistics. *Prereq.* MTH 1227.

CIV 1650 Legal Aspects of Civil Engineering 4 QH

Introduces business law for engineering organizations, including description and evaluation of various types of contracts for engineering services and construction, procedures for submitting bids, procedures for claims, and legal steps to minimize risk exposure, both in United States and international business. *Prereq.* Seniors only.

CIV 1777 Honors Adjunct 1 QH

To be added to any 4 QH course in the department when approved by the Honors Committee of the College of Engineering. Once approved, the adjunct information is forwarded to the honors office for dissemination to the honors membership. Students may enroll in CIV 1777 an unlimited number of times as it can be adjunct to any civil engineering course.

CIV 1810 Special Topic in Civil Engineering 4 QH

This is a special course within the field of civil engineering initiated by the appropriate discipline committee and approved by the department. *Prereq.* Permission of instructor.

CIV 1820 Special Project in Civil Engineering 4 QH

Offers individual study in an area within the field of civil engineering, selected by the student and his or her instructor with approval by the appropriate discipline committee, resulting in a definitive report and an oral presentation. *Prereq.* Outstanding academic performance.

Electrical Engineering

The course descriptions listed under electrical engineering are intended to show the general scope of the subject that will be covered. Since courses are continually updated, specific topics or methods of approach may vary from term to term.

ECE 1171 Electrical Engineering 1 4 QH

Introduces electric circuit theory. Covers Kirchhoff's laws, loop and nodal analysis, Thevenin's theorem, power and energy, exponential excitation, and the system function. *Prereq.* MTH 1128; not open to electrical engineering majors.

ECE 1215 Circuits and Systems 1 4 QH

Topics include electric circuit elements, sources, Kirchhoff's laws, Tellegen's theorem, Thevenin's theorem, mesh and node equations, power and energy, linearity and time invariance, response to exponential excitations, and system function. *Prereq.* MTH 1125 and PHY 1223.

ECE 1216 Circuits and Systems 2 4 QH

Topics include forced and force-free response of networks, singularity response, "pre-box" concept, classical a-c response, application of Laplace transform to circuit problems and determination of initial conditions, and the driving-point and transfer functions of circuits. *Prereq.* ECE 1215.

ECE 1217 Circuits and Systems 3 4 QH

Demonstrates power and energy, reciprocity, magnitude and phase plots, and n-port network theory. Analyzes frequency domain analysis of circuits, stability considerations; and the concept of state variables for networks, natural frequencies, and eigenvalues. *Prereq.* ECE 1216 and MTH 1225.

ECE 1221 Measurements Laboratory**1 QH**

Covers fundamentals of electrical measurements and instrumentation. Topics include electrical characteristics of meter movement and its use in designing ammeters and voltmeters; sources of DC current and voltage and their characteristics; the oscilloscope and its application to the display of waveforms and I-V curves of the two-terminal devices; and the measurements of amplitude, phase, and time interval. Lab fee. *Take ECE 1215 concurrently.*

ECE 1222 Circuits Laboratory 1**1 QH**

Offers experiments in basic circuits and measurement. Topics include AC waveforms and circuits for the measurement of peak, average, and rms values; network theorems, that is, Thevenin and Norton, their application and experimental verification; and null circuits such as the Wheatstone bridge and potentiometer. Discusses characterization of simple LTI circuits including RL, EC, and RLC by investigation of their step response and impulse response. Lab fee. *Take ECE 1216 concurrently.*

ECE 1223 Circuits Laboratory 2**1 QH**

Lab experiments include controlled sources sinusoidal excitation of first order RC and second order RLC networks; the determination by measurement of magnitude and phase (Bode) plots; and investigation of the resonance phenomenon. Lab fee. *Take ECE 1217 concurrently.*

ECE 1224 Electronics Laboratory 1**1 QH**

Follows from ECE 1346. Experiments include p-n junctions and diodes, regulation and power supplies, transistor biasing and bias stability, and MOS digital circuits. *Prereq. ECE 1346. Take ECE 1347 concurrently.*

ECE 1225 Electronics Laboratory 2**1 QH**

Follows from ECE 1347. Experiments designing and verifying basic analog circuit functions utilized in integrated circuits. Advantages inherent to ICs, such as component matching and tracking, are exploited in the circuit building blocks investigated. Studies output power stages, current sources, amplifying stages, and differential amplifiers. Topics include applications to signal amplification, D-to-A conversion, and the extraction of weak signals buried in interference. Lab fee. *Prereq. ECE 1347. Take ECE 1349 concurrently.*

ECE 1226 Discrete Systems Laboratory**1 QH**

Utilizes a personal computer to study and explore various aspects of A/D and D/A conversion such as aliasing and quantization and some aspects of discrete Fourier transforms and digital filters. Lab fee. *Take ECE 1333 concurrently.*

ECE 1227 Electromagnetic Fields Laboratory 1**1 QH**

Lab designed to support class material related to microwave transmission and radiation. Experiments include microwave transmission line measurements and the determination of the properties of dielectric materials; transmission line length measurement; reflection and impedance measurement of dipole antenna; frequency characteristics of antennas and waveguides; and mutual coupling and radiation pat-

tern determination. Lab fee. *Take ECE 1364 concurrently.*

ECE 1228 Electromagnetic Fields and Energy Conservation Laboratory 2**1 QH**

Presents static and quasi-static (low frequency) applications of electromagnetic fields and electromechanical energy conversion. Experiments in electromagnetic fields include measurement of static electric potentials in electrode structures and numerical solution of Laplace's equation and static magnetic field measurements of coil configurations. Experiments in energy conversion include transformers and induction motors. Investigates hysteresis, transformer and motional emfs, and development of electromagnetic torque. Lab fee. *Take ECE 1365 concurrently.*

ECE 1229 Digital Systems Laboratory**1 QH**

Introduces some aspects of computer hardware design encountered at the digital logic level. Discusses both combinational logic and sequential logic units. Focuses on MSI devices including multiplexers, decoders, counters, shift registers, PROM, RAM, and ALU. Demonstrates the design of Mealy and Moore sequence detectors and other digital subsystems such as parallel binary divider. Lab fee. *Coreq. ECE 1382.*

ECE 1230 VLSI System Design Laboratory**2 QH**

Examines the design, layout, and simulation of digital VLSI circuits using a comprehensive set of CAD tools. Studies layouts of NMOS and CMOS combinational and sequential circuits using either a layout editor or automatic layout generators. Studies functional structures including registers, adders, decoders, ROM, PLAs, counters, RAM, and ALU. Utilizes logic and circuit simulators for the logic verification and timing simulation of designed circuits. Lab fee. *Take ECE 1351 concurrently.*

ECE 1231 Electric Power Laboratory 1**1 QH**

Presents a power systems design project encompassing one or more of the following computer studies: transmission line constants, power flow, short circuits, and transient stability. Uses a personal computer to upgrade the design of a small power system. Lab fee. *Take ECE 1472 concurrently.*

ECE 1232 Electric Power Laboratory 2**2 QH**

Lab experiments cover topics in electromechanical energy conversion employing the "Faraday Law machine" bench. Studies Faraday's Law, transformers, reluctance and induction motors, and synchronous machines. Lab fee. *Prereq. ECE 1472 and coreq. ECE 1371.*

ECE 1233 Semiconductor Processing Laboratory**2 QH**

Covers fabrication and testing of simple MOS integrated circuits. Compares process and device models introduced in ECE 1406 with experimental results during weekly lab sessions. Processing includes oxidation, diffusion, lithography, etching, metallization, and characterization. Fabricated diodes, MOS capacitors and transistors, and simple gates will be electrically characterized. Lab fee. *Take ECE 1406 concurrently.*

ECE 1234 Digital Signal Processing Laboratory 2 QH

Focuses on programming a digital signal processing chip in its native assembly language, and performing input/output operations via A-to-D and D-to-A converters. Studies real time signal processing operations and hardware aspects of DSP systems. Considers applications to digital frequency synthesis, computation of discrete time convolution, speech scrambling through frequency inversion, and design and implementation of both FIR and IIR digital filters. Lab fee. *Take ECE 1456 concurrently.*

ECE 1235 Control Systems Laboratory 1 QH

Lab experiments familiarize the student with the practical aspects of control systems design. Topics include analog computer simulation, digital computer control, and use of a programmable controller. Experiments with PID control and emphasizes computer implementation of feedback compensations. Lab fee. *Take ECE 1420 concurrently.*

ECE 1332 Linear Systems 1 4 QH

Focuses on basic concepts and techniques of continuous linear system theory. Topics include system theory in terms of the convolution integral; waveform representation in terms of the Fourier series, Fourier integral, and the bilateral Laplace transform; system concepts in terms of the system function and their application to filters and feedback systems. *Prereq. ECE 1217.*

ECE 1333 Linear Systems 2 4 QH

Topics include historical review and future perspectives of discrete systems; representation of digital signals, sampling, quantization; introduction to digital filters, moving average filters; Z-transforms, inverse Z-transforms; recursive digital filters, stability considerations; and steady-state and transient response. Introduces nonrecursive techniques, the discrete Fourier transform, the fast Fourier transform, and applications to computation of systems transfer functions. *Prereq. ECE 1332.*

ECE 1346 Electronics 1 4 QH

Emphasizes the use of solid-state active devices in digital circuits. Introduces binary values, logic operations, flip-flops, and registers from the viewpoint of symbolic logic gates, Boolean algebra and Karnaugh maps. Other topics include solid-state devices for the realization of logic functions; concepts of diodes; BJT and field-effect characteristics leading to the use of such devices in implementing inverters, NAND and NOR gates for T²L, CMOS and NMOS logic families. *Prereq. ECE 1216.*

ECE 1347 Electronics 2 4 QH

Emphasizes the use of transistors, including integrated devices in the design of analog circuits. Topics covered include biasing, linearized incremental model characteristics such as gain and impedance levels, early effect, use of signal flowgraphs and frequency response for single and compound stages, and an introduction to operational amplifiers. *Prereq. ECE 1346.*

ECE 1349 Electronic Design 1**4 QH**

Studies the design of analog circuits with emphasis on operational amplifiers. Topics include concepts of feedback, open- and closed-loop gain, effect of feedback on impedance levels, frequency response, and stability and compensation in feedback systems. Introduces ECL from the viewpoint of feedback, followed by an analog/digital design example. *Prereq. ECE 1347.*

ECE 1350 Electronic Design 2**4 QH**

Continues ECE 1349. Emphasizes the design of systems involving analog, digital and analog/digital approaches to signal acquisition and processing. *Prereq. ECE 1349.*

ECE 1351 Special Topics in IC Design**4 QH**

Offers a structured digital MOS design course in designing, verifying, and fabricating both NMOS and CMOS VLSI integrated circuits. Introduces required design rules and relates them to the fabrication process. Begins design exercises and tutorials with basic inverters and proceeds to the design, verification, and performance of large complex digital logic networks. Develops a simple RD delay model in conjunction with the theory of delays in VLSI systems. Other topics covered include program logic arrays and automatic design tools, shift registers, arithmetic logic units, and memory systems. *Prereq. ECE 1382. Take ECE 1230 concurrently.*

ECE 1363 Electromagnetic Field Theory 1**4 QH**

Starting with Maxwell's equations, studies the major areas of statics, dynamics, quasi-statics, and material media. Statics covers the study of the electrostatic and magnetostatic fields, including the scalar electric potential and vector magnetic potential. In dynamics, presents Faraday's law and Ampere's law for time-varying electromagnetic fields. Quasi-statics introduces the concept of electromechanical coupling with applications to elementary energy conversion, both electric and magnetic devices. Material media covers the macroscopic model of dielectric materials; the electric polarization and the electric flux density vector; macroscopic model of magnetic materials, magnetization, and magnetic field intensity; and boundary conditions. *Prereq. MTH 1225 and PHY 1223.*

ECE 1364 Electromagnetic Field Theory 2**4 QH**

Introduces the applications of electromagnetic field theory. Based on Maxwell's equations for time-varying fields, develops the following areas: waves and energy, including plan wave propagation, waveguides and Poynting's theorem; radiation, with emphasis on spherical waves and elementary scattering and application to antenna design; distributed systems terms of waveguide circuit concepts, transmission lines, and Smith chart techniques. Presents other applications in the optics and acoustics areas. *Prereq. ECE 1363.*

ECE 1365 Electromagnetic Fields and Energy Conversion**4 QH**

Focuses on the static and quasi-static solution of the electromagnetic field equations and emphasizes energy conversion and transducers. Topics include electrostatics; dielectric materials and transducers; magnetostatics; magnetic materials and transducers; and magnetic circuits, transformers, and energy conversion concepts applied to DC, synchronous, and induction machines. *Prereq.* ECE 1364.

ECE 1371 Electrical Machines 1**4 QH**

Reviews electromagnetic field theory as applied to electromechanics. Discusses magnetic circuits, transformers, and their circuit representations; principles of electromechanical energy conversion (state-variable formulation of electromechanical coupling, singly and multiply excited magnetic-field systems; elementary concepts of rotating machines including transformer emf, speed emf, and torque production); steady-state theory and performance of basic rotating machines such as induction, synchronous, and DC commutator machines through circuit-model concepts. *Prereq.* ECE 1365.

ECE 1372 Electrical Machines 2**4 QH**

Covers dynamic behavior of electromechanical devices; transient performance of synchronous machines; synchronous and induction-machine dynamics; and DC machine dynamics. *Prereq.* ECE 1371.

ECE 1379 Transients in Electric Power Systems**4 QH**

Introduces transient response in electrical power systems. Topics include lightning; switching; faults; and protection against transient overvoltages. Considers transmission lines, transformers, circuit breakers, surge arresters, and fuses in terms of transient response. *Prereq.* ECE 1333.

ECE 1381 Computer Engineering 1: Introduction to Computer Architecture**4 QH**

Presents a view of the architecture of a modern computer; the visible architecture provides the starting point. Assembly language programming is used to develop a foundation on the hardware which executes a program and shows what a compiler, assembler, and linker do and how they interact with the architecture. Explores data structures from a programmatic perspective (static storage, stack, and heap) and from a high-level language perspective (simple data types, and structured data types). Covers several types of computer number systems and arithmetic (2s-complement, IEEE floating point, and logical operations). Includes numerous programming exercises and a software design project to develop working facility with the tools and concepts that underlie the next three computer engineering courses. *Prereq.* GE 1100 or equiv.

ECE 1382 Computer Engineering 2: Design of Digital Logic Machines and Circuits**4 QH**

Continues ECE 1381 with a bottom-up view of the design of logic machines, leading to the design of a simple digital computer by the end of the quarter. Covers Boolean switching algebra and gate-count

minimization; combinational design; sequential circuits; state machines; PLA, PAL, and ROM realizations; CPU design, design of the ALU, and control unit design. Introduces CAD logic design tools. Requires a design project using SSI and MSI chips to develop facility in the design and testing of functional digital circuits. Proof of the circuit will be done using the CAD tools. *Prereq.* ECE 1381.

ECE 1383 Computer Engineering 3: Microprocessor-Based Design**4 QH**

Focuses on the hardware design for modern microprocessor systems. Topics include microprocessor systems architecture; HP64000 microprocessor development system; support circuits; microprocessor busses; electrical characteristics and buffering; memory systems, memory maps, and address decoding; timing in microprocessor systems; asynchronous and synchronous bus protocols; and troubleshooting microprocessor systems. Covers I/O-port design and interfacing using VLSI devices; parallel and serial ports; communication protocols and synchronisation to external devices; hardware and software handshake; serial communication protocols; and RS 232C, RS 422, and RS 423 serial interface standards. Investigates exception processing and interrupt handlers, interrupt generation, interfacing, and vectoring. Includes comprehensive lab exercises that let groups of three students build a modern microprocessor system and execute a small project that enhances the system with useful hardware or software. *Prereq.* ECE 1382.

ECE 1384 Computer Engineering 4: Hardware and Software for Microprocessor Interfaces**4 QH**

Focuses on the interaction of software and hardware necessary to interface microprocessor systems to the real world. Topics include special-purpose I/O devices; timers; D/A and A/D converters; DMA controllers, and disk controllers. Surveys bus design and bus protocols: VME bus, IEEE-488 (GPIB) instrument bus, small computer system interface (SCSI) bus. Analyzes real-time programming: I/O techniques, event-handling delays, and data throughput rates. Considers BIOS, monitors, simple operating systems, multitasking, and memory management. Most of the course is taught in the context of one modern microprocessor, but other microprocessors will also be discussed. Includes several lab exercises and a project implementing hardware and software for a complex microprocessor interface. *Prereq.* ECE 1383.

ECE 1385 Computer Engineering 5: Introduction to Robotics**4 QH**

Studies intelligent interactions between machines and their environment with emphasis on sensory (vision)-driven locomotion and manipulation. Examines integration of sensors, manipulators, and computers into intelligent robotic systems. Demonstrates vision, touch, force, position, proximity, and torque sensors and their role in adaptive control of robot movements. Other topics include computational needs of sensory data processing; VLSI implementation of data-driven architectures for low-level

vision; image processing and understanding as a means of developing symbolic models of the visual (sensory) world; manipulator kinematics and dynamics; VLSI controllers for multicoordinate robotic systems; robotic software tools, including high-level language and decision-making functions; and real-time microprocessor networks and control hierarchies within the robot. *Prereq.* ECE 1333, ECE 1382, and ECE 1383.

ECE 1386 Computer Engineering 6: Structure of Large-Scale Computer Systems 4 QH

Studies large-scale computer systems with applications to robotics, communications, artificial intelligence, and interactive computer design. Covers a global overview of distributed and parallel computing systems for problem solving, planning, and massive data processing. Examines special purpose processors that constitute such complex systems including parallel hardware for image processing, industrial data acquisition and control systems, array processors, and knowledge-based systems. *Prereq.* ECE 1384.

ECE 1390 Senior Project Laboratory 1 2 QH

In this course, students work with a faculty adviser on a term project, either experimental or theoretical. *Prereq.* Permission of department.

ECE 1391 Senior Project Laboratory 2 2 QH

Continues the project started in ECE 1390 or it may be a new project. *Prereq.* Permission of department.

ECE 1400 Special Topics 4 QH

Topics covered vary from term to term depending on the interests of the department and the students. *Prereq.* Permission of department.

ECE 1401 Selected Topics In Electronics 4 QH

Covers the description and application of those electronic devices (thyristors, photodiodes) not covered in depth in the regular electronics sequence; electronic subsystems (AFC, shift registers); and systems (navigation systems, telephone switching systems). Most of the presentations are chosen and made by students, but there are also lectures by invited speakers by the instructor. *Prereq.* ECE 1347.

ECE 1406 Semiconductor Devices and Technologies 4 QH

Surveys microelectronics from crystal growth to interconnection and packaging. Topics include crystal growth and epitaxy; silicon oxidation kinetics and film depositions; photolithography; and diffusion and ion implantation. Discusses the p-n junction diode, the diode equation, and p-n junction fabrication. Reviews metallization techniques, metal oxide semiconductor systems, MOS capacitor and MOS transistor, and VLSI fabrication technologies (bipolar nMOS cMOS). *Prereq.* ME 1386.

ECE 1408 Physical Electronics 4 QH

Develops elements of solid-state theory including wave mechanics, crystalline and amorphous solids, statistical mechanics, and electron transport theory to provide background for a thorough understanding of the junction diode. Explores ohmic contacts and Schottky barriers and the ways that these may be

generated in individual and integrated form. Demonstrates how these elements are joined together to form BJTs and JFETs. *Prereq.* ME 1386.

ECE 1420 Control Systems 4 QH

Comprises closely coupled lectures and laboratory experiments. Topics covered include control system concepts, basic components and goals, modeling and mathematical description, transfer function and state variable representations, feedback control system characteristics, system responses, stability of feedback systems, analysis of graphical tools such as root-locus and Nyquist diagram, compensator design based on root-locus and frequency response, and modern control system design. *Prereq.* ECE 1332 and ECE 1347.

ECE 1430 Electrical Engineering Power Laboratory A 1 QH

ECE 1454 Communication Systems 4 QH

Explores signal representations and characterization; characterization of thermal noise in electronic circuits; amplitude modulation and demodulation; frequency and phase modulation and demodulation; pulse modulation; and transmission of digital information. *Prereq.* ECE 1333 and MTH 1384.

ECE 1456 Digital Signal Processing 4 QH

Introduces modern signal processing. Reviews discrete signals and systems; realization structures for digital filters, including direct forms, cascade forms, and parallel forms; digital filter design, including IIR filter design using impulse invariance and bilinear transformation; and FIR filter design using windowing and frequency sampling. Covers fast Fourier transforms; decimation-in-time and decimation-in-frequency; applications to fast convolution; and implementation of DSP algorithms, including finite word length effects, special purpose hardware to applications in speech processing, and spectral estimation. *Prereq.* ECE 1333.

ECE 1462 Advanced Topics in Electromagnetic Field Theory 4 QH

Continues the required courses in field theory. Topics include microwave and waveguide structures; careful development of electromagnetic energy and force concepts; and an introduction to radiation and antenna theory. *Prereq.* ECE 1364.

ECE 1465 Wave Transmission and Reception 4 QH

Discusses the transmission, radiation, and reception of electromagnetic waves at and above radio frequencies. Develops transmission-line theory using Maxwell's equations and the circuit theory approximations. Discusses matched lines, tuning stubs, and loaded transmission lines, together with the theory and applications of the Smith chart. Presents the theory of guided waves in structures of rectangular and circular cross-section followed by the theory of the cavity resonator. Other topics include the linear antenna, radiation fields, directivity, gain, the aperture antenna, and the insulated antenna. *Prereq.* ECE 1364.

ECE 1466 Optics of Photon Devices 4 QH

Presents the basic optical concepts necessary for an understanding of quantum electronic devices. Analyzes the simple Lorentzian model of the interaction between electromagnetic waves and optical materials, modified to include necessary quantum concepts. Topics include propagation of electromagnetic waves in isotropic and nonisotropic media (crystal optics); reflection and refraction, polarization and double refraction; optical resonance and stability criteria; Gaussian beam propagation; systems with gain; coherent and noncoherent optical sources; and detection of optical signals. Considers specific devices including resonators, amplifiers, and oscillators; modulators and switches; and optical detectors. *Prereq.* ECE 1364.

ECE 1471 Electrical Power Systems 1 4 QH

Introduces electrical power systems, wherein three-phase circuits are analyzed under balanced steady-state operation. Topics include system elements and their characteristics and interaction; system modeling; and network calculations. *Prereq.* ECE 1333.

ECE 1472 Electrical Power Systems 2 4 QH

Continues basic studies in electrical power systems. Topics include power system load-flow analysis; symmetrical components and fault calculations; system protection; economic operation of power systems; and an introduction to power system stability. *Prereq.* ECE 1471.

ECE 1474 Power Electronics 4 QH

Presents the application of semiconductor devices to power supplies and to AC and DC motor drives. Examines power semiconductor devices including silicon-controlled rectifiers (SCR), gate turn-off thyristors (GT), high-power bipolar junction transistors (HPBT), and power MOS field-effect transistors (MOSFET). Reviews characteristics of AC and DC motors and establishes motor drive requirements. Studies applications of rectifiers, inverters, choppers, and cycloconverters. *Prereq.* ECE 1347 and ECE 1365.

ECE 1481 Machine Language and Assembly Language Programming 4 QH

Focuses on study of the machine and assembly languages of a selected digital computer. Covers machine representation of numbers, characters, and instructions; machine language programming: flow of control, relocatability, input/output instructions, addressing, and instruction modification. Traces symbolic assembly language: macros, literals, and pseudo-instructions. Includes several programming projects. *Prereq.* ECE 1191.

ECE 1482 Programming Systems 4 QH

Continues ECE 1481. Discusses assemblers, searching and sorting techniques, and macroprocessors loaders. Introduces high-level languages and their compilation, and operating systems. Includes programming projects as an integral part of the course. *Prereq.* ECE 1481.

ECE 1484 Applied Discrete Analysis 4 QH

Introduces elementary number theory, modern algebra, combinatorial mathematics and discrete probability theory, including prime numbers, least common multiple, and greatest common divisor. Covers Euclid's algorithm, continued fractions, congruences, groups, rings, fields, Boolean algebra, combinations and permutations, generating functions, random variables, and Markov chains. *Prereq.* MTH 1225.

ECE 1486 Numerical Methods and Computer Applications 4 QH

Presents numerical techniques used in solving scientific and engineering problems with the aid of digital computers. Topics include modeling and simulating of deterministic and probabilistic systems; theory of interpolation; iteration methods; numerical solution of ordinary and partial differential equations; signal detection; and use libraries of scientific subroutines. Chooses representative problems for solution on a digital computer. *Prereq.* ECE 1332 and GE 1100.

General Engineering

The course descriptions listed under general engineering are intended to show the scope of the subject that will be covered. Since courses are continually updated, specific topics or methods of approach may vary from term to term.

GE 1100 Computer for Engineers 4 QH

Uses computers to solve engineering problems emphasizing "structured programming" and Pascal. Explores methods of forming and testing an algorithm; introduces software design methods, forming a subprogram and communicating with a subprogram. Topics include establishing and manipulating tables, arrays and matrices, demonstrating how to use a typical numerical methods package—the Turbo Toolbox—to solve advanced engineering problems. Lab fee.

GE 1110 Engineering Graphics and Design 4 QH

Examines manual and computer methods for depicting three-dimensional objects. Presents the orthographic projection system using principal and auxiliary views; analysis of drawings; fundamentals of manufacturing processes; and dimensioning practice. Emphasizes engineering design of components and systems, and computer graphics using software packages. Requires writing programs as an introduction to computer-aided design and manufacturing, and preliminary to design engineering. Lab fee.

Industrial Engineering

The course descriptions listed under industrial engineering are intended to show the general scope of the subject that will be covered. Since courses are continually updated, specific topics or methods of approach may vary from term to term.

IIS 1111 Engineering Software

1 QH

Demonstrates the use of a programming language (Pascal) and Turbo Toolbox in solving mathematical problems, as well as the use of commercially available software for solving engineering problems. Provides practical examples of engineering applications, and lab assignments further illustrate the use of available software in engineering applications.

IIS 1200 Work Design

4 QH

Topics include the engineering design process, principles of work physiology, and workplace design from the standpoint of employee safety and effectiveness. Covers work measurement techniques, including direct measurement, synthetic standards, and work sampling. Includes a project in which principles of work design must be applied.

IIS 1300 Probabilistic Analysis for Engineers

4 QH

Presents probability theory axiomatically, with emphasis on sample space representation of continuous and discrete random variables. Covers standard distributions, expectation, transform techniques, and change of variable. *Prereq.* Integral and differential calculus.

IIS 1310 Statistics I

4 QH

Examines the definition of a statistic; distributions of random variables, including normal, T, chi-square, F, Poisson, and binomial; estimation of parameters; point estimation by method of moments; maximum likelihood; interval estimation; hypothesis testing; and chi-squared goodness-of-fit tests. *Prereq.* IIS 1300.

IIS 1320 Statistics 2

4 QH

Topics include linear regression, analysis of variance, and nonparametric tests. Utilizes computer software to solve linear regression applications. *Prereq.* IIS 1310.

IIS 1330 Principles of Computation and Programming I

4 QH

Reviews algorithms, computers, and programming; machine language programming (instruction, execution, and addressing techniques); coding and representation of data; program debugging and verification. Surveys machines, devices, and languages. *Prereq.* Higher-level language.

IIS 1340 Operations Research I

4 QH

Topics include deterministic models, including LP and duality; transportation and allocation; sensitivity and post-optimality analyses; and network analysis, including maximal flow, shortest route, and PERT. *Prereq.* MTH 1227.

IIS 1341 Operations Research 2

4 QH

Focuses on the stochastic models in operations research and their analytical development and solution. Topics include queuing models, deterministic and stochastic inventory models, Markov chains, and sequencing. Presents dynamic programming and recursive functional expressions. *Prereq.* IIS 1310.

IIS 1345 Management Information Systems

4 QH

Examines the design and implementation of computer-based information systems. Topics include the value of information; tools of system analysis and design; impact of computer-based information systems on organizations and society; rudimentary computer architecture; input devices; data organization and storage; system configuration; communications; and output/display devices.

IIS 1350 Digital Simulation Techniques

4 QH

Covers model development, validation, and experimentation for discrete event simulation models. Topics include problem formulation, data collection and analysis, random variable generation, and statistical analysis of output. Utilizes a major simulation language such as GPSS, SIMAN, or SIMSCRIPT. *Prereq.* Higher-level language.

IIS 1360 Engineering Economy and Statistical Decisions Theory

4 QH

Familiarizes the student with the theory and techniques of economic evaluation of an investment project. Presents introductory steps in the analysis of investment proposals, time value of money, and cash flows. Analyzes deterministic and stochastic cash flows in terms of present worth, annual cost, rate of return, and benefit/cost ratio. Studies decision tree for sequential decisions, criteria for decision making under uncertainty, utility theory, value of information, effect of accounting procedures, and taxes on investment analysis. *Prereq.* IIS 1300.

IIS 1366 Engineering Economy

4 QH

Topics include the formulation of analytical techniques, such as, rate of return, present worth, and annual cost. Considers the application of these techniques to solve business and engineering problems involving design, selection, replacement, lease-buy decisions, and decisions among multiple alternatives. Introduces sensitivity analysis and basic probability in cases where uncertainty exists. Surveys sources and costs of capital, debt-versus-equity financing, and leverage. *Not open to Industrial Engineering majors.*

IIS 1400 Systems I**4 QH**

Examines modeling, analysis, and control of linear feedback systems through consideration of the following topics: differential equations as system models; transfer functions and block diagrams; system components and the method of analogies; accuracy, and stability. *Prereq.* MTH 1225.

IIS 1401 Design Project**4 QH**

Examines analysis and design of major industrial engineering systems. Students are expected to undertake up to five projects drawn from line balancing, job shop scheduling, stochastic network analysis, reliability in design, complex queuing system design, sequencing, or other areas of student and faculty interest. *Prereq.* IIS 1300, IIS 1340, and IIS 1350.

IIS 1405 Production and Inventory Control**4 QH**

Explores basic inventory models and inventory management systems, single-stage and multi-stage systems and their dynamics, production control and aggregate planning, and mathematical and heuristic approaches to aggregate scheduling. Topics include cost structure and decision-oriented analyses, and consideration of job shop scheduling and dispatching problems. *Prereq.* IIS 1300.

IIS 1415 Facilities Design**4 QH**

Examines the use of descriptive and optimizing models (for example, simulation, queuing theory, and linear programming) to design facilities and associated materials-handling systems. Applies computer-assisted layout analysis techniques to problems of real-world scope. *Prereq.* IIS 1340.

IIS 1425 Material Handling System Design**4 QH**

Discusses the design and analysis of large material-handling systems. Topics include computer control of handling systems, integration with production and inspection, automated storage/retrieval systems, automatic identification systems, and systems acquisitions. *Prereq.* IIS 1340.

IIS 1436 Introduction to Quality Control**4 QH**

Covers basic principles to state-of-the-art concepts and application of statistical process control. Applies principles to a variety of products. Topics include measuring and controlling product quality, Shewhart control charts, quality cost, pareto analysis, discrete and variable sampling, and military standards in quality control.

IIS 1440 Total Quality Control (TQC)**4 QH**

Introduces the principles of total quality control (TQC). Examines Japanese methods for controlling technologies in the manufacturing, electrical, steel, construction, and automobile industries. Studies the seven statistical methods of TQC: histograms, cause and effect diagrams, check sheets, Pareto diagrams, graphs, control charts, and scatter diagrams. Includes case studies of TQC implementation in engineering systems and guest lectures by invited authorities. *Prereq.* Junior or senior standing.

IIS 1441 Engineering Reliability/Risk Analysis**4 QH**

Examines principles of reliability and risk analysis of large engineering systems, for example, chemical and electric power plants, dams, manufacturing systems, mechanical, and electrical systems. Discusses failure modes and effects analysis (FMEA tables), reliability block diagrams, success and fault trees, and Bayesian analysis methods. Other topics include the redesign of systems for improved safety, productivity, and availability. Guest lecturers will speak on various case studies from each field of engineering. *Prereq.* IIS 1300 or equiv. or permission of instructor.

IIS 1450 Expert Systems**4 QH**

Introduces students to the theory, topics, and applications of expert systems in engineering. Topics include knowledge representations formats (production rules, frames, networks, and logic systems), heuristics in engineering (deterministic and non-deterministic), fuzzy logic, certainty factors, cognition, memory, decision strategies, design of expert systems, shells, current research goals, and applications in engineering. Each student must complete a term project in expert systems development and/or application. *Prereq.* GE 1100, IIS 1300, IIS 1330, or permission of instructor.

IIS 1465 Microprocessor Applications**4 QH**

Analyzes system architecture of several microcomputers, including microprocessors, bus design, multiprocessor operation, and current trends in processors (8-, 16-, and 32-bit). Discusses interfacing problems and hardware including sensors, actuators, D/A and A/D converters, data transmission, and parallel/serial I/O. Other topics include real-time programming with case studies; network and distributed processing; and development techniques and current state of the art trends. *Prereq.* IIS 1455, assembly language, or permission of instructor.

IIS 1466 Automation**4 QH**

Familiarizes students with the process of manufacturing and potential for automation. Studies designing for automation including required hardware and software. Involves hands-on experience with robotics programming and implementation, programmable control programming, and CNC machine programming using APT and G code. *Prereq.* IIS 1330 and IIS 1465 or permission of instructor.

IIS 1470 Human Considerations in Engineering Design**4 QH**

Introduces human factors with emphasis on the physiological and anthropometric bases of equipment and workplace design. Topics include an overview of the field of human factors; work, fatigue, and endurance; thermal regulation and heat stress; biomechanics; effects of aging on work capacity; and body response to vibration.

IIS 1475 Human Factors**4 QH**

Emphasizes human sensory/motor performance, information-processing capabilities, learning, and skilled-task performance. Topics include an introduction to the experiment as a source of knowledge of human performance characteristics; vision, visual performance, and principles of display design; audition, noise, hearing damage, and auditory signals; information processing; signal detection; aging effects; and system development.

IIS 1480 People in Organizations**4 QH**

Utilizes case studies and focuses on the influence of human behavioral factors on organizational performance. Analyzes research evidence to aid in understanding and anticipating the response of organizational members to management practices. Topics include current theories of organization; motivation; group dynamics and the face-to-face work group; leadership; cognitive aspects of decision making; work enrichment and job satisfaction; and job evaluation. *Prereq. Seniors only.*

IIS 1777 Honors Adjunct**1 QH**

To be added to any 4 QH course in the department when approved by the Honors Committee of the College of Engineering. Once approved, the adjunct information is forwarded to the Honors Office for dissemination to the honors membership. Students may enroll in IIS 1777 an unlimited number of times as it can be an adjunct to any industrial engineering course.

IIS 1800 Independent Study in Industrial Engineering**4 QH**

Independent study on advanced IE topics for students usually in the senior year and with high scholastic standing. Projects may be of an applied or theoretical nature. A formal report is submitted to student's project supervisor at the end of quarter.

Mechanical Engineering

The course descriptions listed under mechanical engineering are intended to show the general scope of the subject that will be covered. Since courses are continually updated, specific topics or methods of approach may vary from term to term.

ME 1111 Key Ideas in Engineering**1 QH**

Introduces first-year students to engineering as a creative practice. Discusses the relationship between engineering and science, and between engineering and economic activity. Explores the challenge, necessity, and satisfaction of lifelong learning in an engineering career.

ME 1201 Statics**5 QH**

Examines vector representation of force and moment; equivalent force systems; centroids and centers of gravity; and distributed forces. Investigates equations of equilibrium; free-body diagrams; applications to trusses, pin-connected frames, and beams; shear and moment diagrams; and elementary concepts in friction. Introduces virtual work. *Prereq. PHY 1222.*

ME 1202 Dynamics I**5 QH**

Develops problem-solving ability in the fundamentals of dynamics. Topics include kinematics of particles, kinematics of rigid bodies, and mass moments of inertia. Examines kinetics of particles and rigid bodies using force, mass, and acceleration. *Prereq. ME 1201.*

ME 1203 Strength of Materials I**5 QH**

Explores the concept of stress and strain; state of stress and strain at a point; and stress-strain relations and material properties. Investigates moment of inertia of areas; stress and deformation of simple members under axial and torsional loads; and stresses in symmetrical beam bending. Involves lab sessions to support the lectures. *Prereq. ME 1201.*

ME 1314 Strength of Materials 2**4 QH**

Topics include asymmetrical bending; analysis of determinate and indeterminate beams by various methods; and buckling of columns. *Prereq. ME 1203.*

ME 1315 Dynamics 2**4 QH**

Continues development of problem-solving ability in dynamics. Topics include kinematics of rigid bodies using rotating frames, kinetics of particles and rigid bodies using work and energy, introduction of Lagrange's equations, kinetics of particles and rigid bodies using impulse and momentum, and simple gyroscopic motion. *Prereq. ME 1312.*

ME 1320 Dynamics for Civil Engineers**4 QH**

Topics include kinematics, translating reference frames, mass moments of inertia, plane motion of rigid bodies, and instantaneous equations of motion. *Prereq. CIV 1210.*

ME 1321 Mechanics for Electrical Engineers**4 QH**

Focuses on the study of kinematics and kinetics of rigid bodies, instantaneous equations of motion, work and energy, and impulse and momentum. *Prereq. PHY 1222.*

ME 1335 Mechanical Design**5 QH**

Covers applications to the design process of the basic concepts of mechanics, strength of materials, and mechanical behavior of materials. Discusses basic considerations in design and its open-ended nature. Reviews fundamentals of stress and deflection analysis; theories of failure; design for fatigue strength; product liability; numerical methods in

design, modeling, simulation; and optimization of mechanical systems. *Prereq.* ME 1314.

ME 1336 Design Project 1

5 QH

Applies the engineering sciences to the design of a system, component, or process. Students will choose the particular design project with the approval of appropriate faculty. Design teams will be organized. Each project will include the use of open-ended problems, development and use of design methodology, formulation of design problem statements and specifications, consideration of alternative solutions, feasibility considerations, and detailed system descriptions. It should include realistic constraints (such as economic factors, safety, reliability, maintenance, aesthetics, ethics, and social impact). *Prereq.* ME 1335 and ME 1337.

ME 1337 Thermal Design

5 QH

Focuses on developing the ability of the students to synthesize their knowledge and understanding of the concepts of thermodynamics, fluid mechanics, and heat transfer to meet the specifications of various thermal design objectives through the assignment of open-ended problems. Reviews fundamentals of heat transfer and fluid mechanics, numerical methods in heat transfer, heat transfer analysis of heat exchangers, heat exchanger pressure drop analysis, modeling, system simulation, and topics in optimization. One or more design projects are assigned. Utilizes various software on mainframe and microcomputers throughout the course and in the projects. *Prereq.* ME 1365.

ME 1338 Design Project 2

5 QH

Continues the project started in ME 1336. Students remain in the same group and under the direction of the same faculty advisers as in ME 1336. *Prereq.* ME 1336.

ME 1340 Thermodynamics

4 QH

Thermodynamics is the study of systems in which energy and its flow across systems boundaries are important. In this course, energy, heat, and work are defined and used in the First Law of Thermodynamics. Introduces other thermodynamic properties and equations of state, with emphasis on tabular and graphical forms for simple compressible systems and on the ideal gas. Introduces the Second Law of Thermodynamics and the property entropy, and discusses their macro- and microscopic implications. Concentrates on basic concepts and their proper application to representative engineering systems. *Prereq.* MTH 1223, not open to ME or ECE power majors.

ME 1360 Thermodynamics I

5 QH

Thermodynamics is the study of systems in which energy and its flow across systems boundaries are important. Defines energy, heat, and work in the First Law of Thermodynamics. Introduces other thermodynamic properties and equations of state, with emphasis on tabular and graphical forms for simple and compressible systems on the ideal gas. Discusses phases and phase transitions, and examines energy analysis of both open and closed systems. Introduces macro- and microscopic implications of the Second

Law of Thermodynamics and the property entropy, and discusses their macro- and microscopic implications. Emphasizes the macroscopic consequences of irreversibility and the limitation this places, through the Second Law, on the behavior of engineering systems. This course meets four times weekly and integrates problem-solving strategies while concentrating on basic concepts. *Take MTH 1223 concurrently.*

ME 1361 Thermodynamics 2

5 QH

Studies of vapor power systems including the Rankine cycle and its modifications for use with both fossil and nuclear fuels, vapor refrigeration systems, and all-gas cycles including the Brayton cycle and its modifications; the Otto cycle; the Diesel cycle; and supercharging and turbocharging. Introduces the concepts of availability and irreversibility and thermodynamics of nonreacting mixtures with applications to air/water/vapor mixtures for air-conditioning systems and cooling towers. *Prereq.* ME 1360.

ME 1362 Thermodynamics 3

5 QH

Continues the thermofluids sequence. Topics include thermodynamic relations using generalized charts; reacting gas mixtures and combustion; and chemical equilibrium. Introduces one-dimensional compressible flow, including isentropic flow with area change; normal shock waves; flow through a constant area duct with friction; and heating. *Prereq.* ME 1361.

ME 1365 Heat Transfer

5 QH

Studies the theories that describe conduction, convection, and thermal radiation heat transfer mechanisms. Discusses steady-state and transient conduction problems in rectangular, cylindrical, and spherical coordinate systems. Studies convective heat transfer mechanisms, and introduces various correlations. Presents a description of thermal radiation heat transfer between surfaces. Includes various lab experiments. *Prereq.* ME 1360, ME 1375, and MTH 1226.

ME 1375 Fluid Mechanics

5 QH

Studies fundamental principles in fluid mechanics. Topics include hydrostatics (pressure distribution, forces on submerged surfaces, and buoyancy); Newton's law of viscosity; acceleration of fluid particles; streamlines; integral formulation of basic laws (conservation of mass, momentum, and energy); differential formulation of basic laws; laminar flow analyses; laminar and turbulent flows; and pipeline analysis. *Prereq.* ME 1360 and MTH 1225.

ME 1380 Materials Science

5 QH

Introduces materials science for engineers, emphasizing the structure/property/function relation. Topics include crystallography, structure of solids, imperfections in crystals, phase equilibrium, phase transformations, diffusion, and physical/electrical properties. Includes a lab. *Prereq.* CHM 1132 and ME 1360.

ME 1386 Materials Science

4 QH

Introduces materials science for engineers, emphasizing the structure/property/function relation. Topics include crystallography, structure of solids,

imperfections in crystals, phase equilibrium, electrical and magnetic properties of metals, semiconductors and junctions. *Prereq.* CHM 1132.

ME 1392 Measurements and Analysis

5 QH

Examines design of experiments, instrumentation, measurements, data analysis, and report writing. Applies the principles developed in class to a variety of lab experiments. Requires written reports. Topics include force, strain, rotational frequency, temperature, pressure, power, and A/D conversion techniques. Lab fee. *Prereq.* None.

ME 1401 Applied Elasticity

4 QH

Topics include analysis of curved beams, rings, and thick-walled pressure vessels; introduction to plane elasticity problems using rectangular and polar coordinate systems; and concepts of stress and strength. *Prereq.* ME 1314.

ME 1408 System Analysis and Control

4 QH

Explores the theoretical background necessary to analyze and design simple linear control systems. Focuses on system modeling, linear approximations and their limitations, transfer functions, and block diagrams; transient and frequency response; and stability. Discusses frequency domain and root locus techniques. *Prereq.* ME 1312.

ME 1410 Design for Space Applications

4 QH

Studies Keplerian motion and transfer dynamics using Battin's solution. Considers optimization of transfer dynamics with respect to our solar system; and mass optimization, boost, and reentry dynamics. Utilizes integrated design throughout the course. *Prereq.* ME 1315.

ME 1415 Mechanical Vibrations

5 QH

Studies one-, two-, and multi-degrees of freedom systems using classical, energy, Laplace, matrix, and computer techniques. Includes lab demonstrating vibration measurement. *Prereq.* ME 1202.

ME 1430 Aspects of Forensic Design

4 QH

Utilizes case studies in which students assume various investigative and court room roles, including (for both plaintiff and defendant) expert witnesses, lawyers, field and office engineers, and jury discussion. Examines consumer protection accidents, the effect of changing standards and codes, classes of mechanical systems normally involved in consumer cases, the methodology of technical questioning, and writing and presenting expert reports. *Prereq.* ME 1335 and ME 1337.

ME 1435 Computer-Aided Design

4 QH

Introduces the concepts of computational and numerical geometry for design. Includes the implementation of computer graphics in design and use of computer-aided design packages. Covers principles of numerical control techniques to design and manufacture. Requires a design project. *Prereq.* GE 1100 and ME 1314.

ME 1436 Advanced Computer-Aided Design

4 QH

Covers advanced applications of interactive graphics concepts to different engineering tasks including animation; solid modeling; numerical control; mass

properties; finite element modeling and analysis; and other traditional engineering analysis. Presents advanced concepts and features of interactive graphics and analysis programming languages. Includes FORTRAN interface and CAD/CAM packages to give students hands-on experience in lab settings. Requires a design project. *Prereq.* ME 1435.

ME 1470 Fluid Mechanics 2

4 QH

Topics include velocity potential and stream functions; circulation and Kelvin's theorem; two-dimensional, steady irrotational incompressible flow; and Karman-Pohlhausen method applied to two-dimensional boundary layers. *Prereq.* ME 1375.

ME 1473 Gas Dynamics

4 QH

Focuses on application of the principles of fluid mechanics to compressible flows. Discusses wave propagation and the concepts of sound speed and Mach number. Emphasizes one-dimensional steady flows including the effects of area change, friction, and heat transfer. Considers normal shock waves and the possibility of choking. *Prereq.* ME 1375.

ME 1480 Mechanical Behavior of Materials

4 QH

Studies the physical basis for the mechanical behavior of solid materials, including elasticity, plasticity, viscoelasticity, and fracture. Discusses structural alloys and polymers. *Prereq.* ME 1203 and ME 1380.

ME 1483 Materials Processing

4 QH

Surveys the essential features and materials limitation of various methods for processing materials. Topics include heat treatment (ferrous and nonferrous alloys), casting, forming, joining, and machining. *Prereq.* ME 1380.

ME 1490 Special Topics

4 QH

When offered, topics will vary depending on the previously expressed interests of a group of students and/or of the department. *Permission of the department.*

ME 1496 Mechanical Engineering Project 1

4 QH

Involves a project of an analytical or experimental nature. Each student must, before the end of the second week of the quarter, obtain written approval for a proposed project from a department faculty member under whom the student will work. It is suggested that approval be secured before registration. A formal report must be submitted to the faculty supervisor at the end of the quarter. *Prereq.* ME 1390; *cannot be taken simultaneously with ME 1495 or ME 1497.*

ME 1497 Mechanical Engineering Project 2

4 QH

If a project initiated under course ME 1496 is large enough in scope, a second project course may be taken with the approval of the faculty supervisor. A formal report must be submitted to the student's faculty supervisor at the end of the quarter. *Prereq.* ME 1496; *cannot be taken simultaneously with ME 1495 or ME 1496.*

ME 1541 Nuclear Engineering 1

4 QH

Studies nuclear physics emphasizing atomic and nuclear structure, and radioactive decay and nuclear reactions, with particular attention to fusion and

fission. Examines health physics, nuclear instrumentation, and the production and uses of radioactive isotopes. Compares thermal, fast, and breeder reactor types prior to a discussion of neutron interactions and their slowing down. Develops the four-factor formula and diffusion equation as applied to one-group theory for bare and reflected thermal reactors. Discusses flux shaping as well as energy production and distribution within the core. *Prereq.* ME 1361.

ME 1542 Nuclear Engineering 2 4 QH
Focuses on development of two-group theory for thermal reactors and considers the physics and safety of fast reactors. Discusses the effect of reactivity change, either intentional or accidental, as well as changes due to temperature, fission product build-up, xenon build-up after shutdown, and fuel depletion. Explores reactor design considerations involving the interrelation of reactor physics, reactor engineering control, distribution of power, and fuel cycle management. *Prereq.* ME 1541.

ME 1545 Internal Combustion Engines 4 QH
Presents the concepts and theories of operation of internal combustion engines based upon the fundamental engineering sciences of thermodynamics, gas dynamics, heat transfer, and mechanics. Discusses the design and operating characteristics of conventional spark-ignition, compression-ignition, Wankel, and stratified charge spark-ignition engines. Includes performance analysis using computer programs and Newhall-Starkman charts. *Prereq.* ME 1361.

ME 1580 Engineering Materials 4 QH
Discusses the utilization of materials science in the application and selection of materials. Topics include reactions with environment, such as oxidation and corrosion; materials selection criteria; and materials engineering case studies dealing with materials selection and failure analysis. *Prereq.* ME 1380.

ME 1702 Dynamics 1 (Honors) 5 QH
This course is identical to ME 1202. The honors section will meet as a separate recitation section for additional lectures and other activities related to the theory and applications of dynamics. *Prereq.* ME 1201.

ME 1703 Strength of Materials 1 (Honors) 5 QH
This course is identical to ME 1203. The honors section meets separately for lab and other activities related to the theory and applications of strength of materials. *Prereq.* ME 1201.

ME 1760 Thermodynamics 1 (Honors) 5 QH
This course is identical to ME 1360. The honors section will meet as a separate recitation section for additional lectures and other activities related to the theory and applications of thermodynamics. *Take MTH 1223 concurrently.*

ME 1765 Heat Transfer (Honors) 5 QH
This course is identical to ME 1365. The honors section meets separately for lab and other activities related to the theory and applications of heat transfer. *Prereq.* ME 1360, ME 1375, and MTH 1226.

ME 1777 Honors Adjunct 1 QH
To be added to any 4 QH course in the department when approved by the Honors Committee of the College of Engineering. Once approved, the adjunct information is forwarded to the Honors Office for dissemination to the honors membership. Students may enroll in ME 1777 an unlimited number of times as it can be an adjunct to any mechanical engineering course.

ME 1780 Materials Science (Honors) 5 QH
This course is similar to ME 1380. The honors section meets separately for lab and other activities related to the theory and applications of materials sciences. *Prereq.* CHM 1132 and ME 1360.

ME 1796 Mechanical Engineering Project 1 (Honors) 4 QH
Involves an analytical or experimental project. Open only to students who are in the Honors Program or by approval of the department chair. Before registration, each student must obtain written approval for a proposed project from a department faculty member under whom the student will work. A formal report must be submitted to the faculty supervisor at the end of the quarter. *Prereq.* All required courses through quarter 9.

ME 1797 Mechanical Engineering Project 2 (Honors) 4 QH
This course continues ME 1796. Before registration, each student must obtain written approval of the department chair. *Prereq.* All required courses through quarter 9.

Computer Science

COM 1100 Fundamentals of Computer Science 4 QH
Introduces computers and computer programming via a brief overview of text editing and system commands. Reviews basic concepts of a high-level language: data types, variables, assignment, expressions, statements, and input/output. Surveys the tools of structured programming: flow control constructs, use of procedures and functions, parameters and local variables, and user-defined data structures. Other topics include strings, arrays, record structures, and keyboard/screen input/output.

Emphasizes the systematic design of programs using structured components.

COM 1101 Algorithms and Data Structures 1 4 QH
Introduces algorithms, data structures, abstraction, and modularization; elementary searching and sorting; sequential files: text and binary; and the use of recursion to express algorithms. Covers the use of pointers to create linked structures; singly and doubly linked lists and circular lists; sorted insert into lists; and stacks and queues treated using both arrays and linked lists. *Prereq.* COM 1100 or COM 1108.

COM 1102 Symbolic Programming and its Applications**4 QH**

Introduces the fundamental concepts and applications of functional programming and their relationship to computer science. Reviews basic ideas underlying symbolic information processing and the role of LISP in this context. Covers applications selected from artificial intelligence, programming language design and implementation, procedural and data abstraction, and development of data-driven programs. *Prereq.* COM 1101.

COM 1105 Computer Science and its Applications**4 QH**

Provides an opportunity for students of all majors to understand and experience the field of computer science and to become informed and intelligent users of the tools of this science. Allows students to explore such topics as artificial intelligence, graphics, and database design by manipulating small, controlled "worlds" that model scientific, social, or business phenomena. Examines tools such as word processing, database management systems, spreadsheets, graphics, statistics, and a simple programming environment. Discusses relevant theoretical, historical, social, cultural, and ethical issues.

COM 1107 Introduction to Programming for Non-Computer Science Majors 1**4 QH**

Introduces the Pascal language and the writing of computer programs. Examines variables, assignment, screen input-output, flow control (decisions and loops). Explores program design and problem solving using procedures and functions.

COM 1108 Introduction to Programming for Non-Computer Science Majors 2**4 QH**

Examines simple data structures (arrays and strings), user-defined data structures, records, combinations of arrays and records, text file input-output, and simple graphics. Introduces recursion. Emphasizes examples that focus on problem solving and applying programming to other disciplines. *Prereq.* COM 1107.

COM 1110 FORTRAN Laboratory**1 QH**

Considers elements of FORTRAN programming for those familiar with a high-level language such as Pascal or C. Includes input/output, subroutine linkage, and methods of structured programming in FORTRAN. *Prereq.* COM 1100.

COM 1114 C Laboratory**1 QH**

Examines elements of C programming for those familiar with a high-level language such as Pascal and with elementary data structures. Emphasizes how C combines tools for structured programming with mechanisms for producing efficient code. Introduces UNIX. *Prereq.* COM 1101.

COM 1121 Computer Science Overview 1**1 QH****COM 1122 Computer Science Overview 2****1 QH**

Reviews and gives practice to the intellectual skills needed for success as a computer science major. Discusses issues that can affect academic success and introduces the intellectual and cultural opportunities at Northeastern University and in Boston.

Includes readings about major figures in computing and guest lectures that survey advanced fields in computer science. Looks ahead to professional work in computer science. *Prereq.* Computer science major.

COM 1130 Computer Organization and Programming 1**4 QH**

Introduces computer organization and programming at the assembly-language level. Topics include arithmetic instructions, memory organization and data representation, addressing modes, flow control instructions, subroutines, procedures and linkage with higher-level languages, run-time stack structure, implementation of recursion, floating point and bit instructions, terminal I/O using system services or higher-level languages, and use of the debugger. *Prereq.* COM 1101.

COM 1131 Computer Organization and Programming 2**4 QH**

Focuses on user-defined macros, character string instructions, decimal instructions and conversion, queue instructions, exception handlers, digital circuits, gate minimization, and combinational systems. *Prereq.* COM 1130.

COM 1201 Algorithms and Data Structures 2**4 QH**

Introduces complex data structures and the corresponding algorithms for manipulation. Examines trees; binary search; priority queues, heaps, and heapsort; and quicksort. Introduces analysis of algorithms. Surveys graphs; depth-first and breadth-first search; shortest path and minimal spanning tree; sets, union, and find; hashing; and balanced trees. *Prereq.* COM 1101 and MTH 1137.

COM 1205 Software Design and Development**4 QH**

Presents the latest ideas and techniques in software methodology and provides a means for students to apply these techniques. Students, working in groups, will be expected to design, implement, test, and document a large software project. *Prereq.* COM 1201.

COM 1310 File Structures**4 QH**

Examines access characteristics of secondary storage devices (tapes, disks and drums); external sorting and merging for heap files; and algorithms for common file operations on heap, hashed, ISAM, B-tree, dense indexes and TRIE file structures. Covers overflow techniques; comparison of operations by block access count; and files with variable length records. Other topics include data compression techniques; structures for secondary access (multilist and inverted files); and retrieval for partially specified records and ranges of records. *Prereq.* COM 1130 and COM 1201.

COM 1315 Database Management 1**4 QH**

Emphasizes the concepts and structures necessary to design and implement a database application and surveys some existing systems. Introduces database concepts and database modeling and entity relationship diagrams. Reviews physical data organization; the relational model, QUEL, and ISBL; design of a relational model and normal forms; and data definition and data manipulation languages for network

and hierarchical models. Compares models, some languages, and implementations for these models. *Prereq.* COM 1310.

COM 1316 Database Management 2 4 QH

Focuses on database systems that support relational model applications. Topics include recovery, query optimization, integrity, and security and concurrency, with examples based on INGRES and System R. Covers additional topics such as database machines at the discretion of the instructor. Implements a small relational DBMS. *Prereq.* COM 1315.

COM 1330 Systems Programming 4 QH

Studies the structure and function of operating systems and their components. Emphasizes the fundamental issues in operating-system design: concurrency, deadlock handling, CPU scheduling, memory management, virtual memory, and I/O management. Allows students to program several resource management algorithms and evaluate them using simulation. *Prereq.* COM 1114 and COM 1131 or knowledge of the C language.

COM 1335 Operating Systems 1 4 QH

Presents an in-depth study of the algorithms and problems encountered in operating-system design. Investigates asynchronous concurrent processes, scheduling, resource management, design of the I/O subsystem, and system initialization. Illustrates issues that arise in design decisions through a detailed study of a small UNIX-like operating system. *Prereq.* COM 1330.

COM 1336 Operating Systems 2 4 QH

Explores advanced topics in operating system design. Allows students to complete the study of device management begun in COM 1335 and implement a device driver for a small operating system. Covers topics in theoretical aspects of operating system design such as mechanisms for high- and low-level synchronization, deadlock, distributed algorithms, management of paged memory, queueing theory, and computer security. *Prereq.* COM 1335 and MTH 1387.

COM 1350 Automata and Formal Languages 4 QH

Topics include finite-state machines and regular expressions; context-free grammars; properties and decidability problems of regular and context-free languages; pushdown automata; pumping theorems for regular and context-free languages; and Turing machines, Church's thesis, and the halting problem. *Prereq.* COM 1201 and MTH 1137.

COM 1355 Compiler Design 1 4 QH

Implements concepts such as finite state automata, regular expression pattern matching, and context-free grammars using a lexical analyzer and a compiler-compiler. Emphasizes LALR(1) or LL(1) parsing with exposure to top-down, bottom-up, and operator-precedence methods. Examines ambiguous grammars and may include some code generation. Uses a "hands-on" approach, including either a sequence of programming assignments or a project. *Prereq.* COM 1131 and COM 1350.

COM 1356 Compiler Design 2 4 QH

Discusses advanced topics related to code generation: run-time environment, symbol table organization, and scope rules. Other topics include type checking, aggregate types (arrays and records), error analysis and recovery, code optimization, tail recursion, functional programming, and polymorphic functions. Implements theoretical ideas through programs or a large project. *Prereq.* COM 1355.

COM 1358 Analysis of Programming Languages 4 QH

Topics include run-time behavior of programming languages; interpreters; static and dynamic scoping; parameter-passing mechanism; implementation of functions and recursion; and features of current languages and their implementation. *Prereq.* COM 1102.

COM 1370 Computer Graphics 4 QH

Focuses on characteristics and programming of graphics output devices. Presents basics point and line drawing, two-dimensional displays, and clipping and windowing. Surveys pictures: data structures and display file organization; and interaction: graphical input and external events-operating system considerations. Includes some three-dimensional drawing. *Prereq.* COM 1201 and MTH 1301.

COM 1390 Analysis of Algorithms 4 QH

Introduces the basic principles and techniques of analyzing algorithms. Topics include algorithms on sorting, searching, graphs, and digraphs (such as minimal spanning tree, shortest path, depth-first search, components of a graph); and methods involving string matching, polynomials and matrices. Considers fast Fourier transform and the concept of N P-complete problems. *Prereq.* COM 1201, MTH 1125, MTH 1137, and MTH 1301.

COM 1410 Artificial Intelligence 4 QH

Focuses on analysis of current computer algorithms dealing with problems such as theorem proving, chess playing, general problem solvers, robotics, symbolic computation, perceptions, and self-reproducing automated parallel machines. *Prereq.* COM 1102, COM 1201, and MTH 1409.

COM 1420 Principles and Methods in Interactive Systems Design 4 QH

Introduces principles of computer-human interface (software) design, and methodologies of implementation, evaluation, and research in computer-human interaction. Topics include user psychology, dialog styles (menu interfaces, command languages, icons, windows), screen layout and design, input and output devices (mouse, touchscreen, keyboard, voice technology), error handling/reporting and system response time, user documentation, and "intelligent" interfaces. Traces techniques for implementing software-human interfaces, and methodologies for testing and assessing the "usability" of interactive systems.

COM 1600 Computer Science Project 4 QH

Presents the latest ideas and techniques in software methodology and provides a means for students to apply these techniques. Students, working in groups,

will be expected to design, implement, test, and document a large software project. *Prereq.* COM 1102, COM 1110, COM 1201, and COM 1355.

COM 1621 Computer Science Seminar 1 QH

A capstone course for computer science majors. Meetings are held once or twice per week and a current topic or problem in computer science is presented by an expert in the subject matter. Students are assigned additional questions and/or problems to research in the topic area as an aid to developing a deeper appreciation and understanding of various aspects of computer science. *Prereq.* Computer science seniors only.

COM 1700, COM 1701, COM 1702, COM 1720, COM 1730, and COM 1731 4 QH each

Offers a special section for honors students in COM 1100, COM 1101, COM 1102, COM 1201, COM 1130, and COM 1131 respectively. *Prereq.* Enrollment in the Honors Program or permission of the instructor.

COM 1705, COM 1717, COM 1737, and COM 1757 5 QH each

Offers a special section for honors students in COM 1205, COM 1316, COM 1335, and COM 1350 respectively. *Prereq.* Enrollment in the Honors Program or permission of the instructor.

COM 1770 Honors Computer Science Seminar 4 QH

Offers a capstone course for computer science honors students. Exposes students to a variety of com-

puter science topics of current interest, and provides an opportunity to improve skills in presenting technical material. Requires students to prepare a one hour presentation of professional quality on a topic of interest in computer science. Requires the student to write paper on the same topic.

COM 1777 Honors Adjunct Computer Science 1 QH

Allows honors students who do not have an honors section to do honors work in one of the computer science elective courses while enrolled in the regular course.

COM 1800 Directed Study in Computer Science 4 QH

Programs of directed study, held one or more quarters, are available for highly motivated students who wish to explore in depth special topics in computer science. Directed study can be used as an opportunity to examine familiar material in fresh ways or to explore new material that is not offered in formal courses. Provides students strong in computer science and related sciences a chance to develop the art and skill needed to work independently and creatively in computer science. *Prereq.* Permission of the instructor; may be repeated for credit.

COM 1810 Topics in Computer Science 4 QH

Focuses on an advanced topic in computer science to be selected by the instructor. *Prereq.* Permission of the instructor.

Engineering Technology

Chemical Engineering Technology

CHT 1381 Nuclear Technology 4 QH

Discusses atomic and nuclear structure, discovery and nature of radioactivity-clear reactions and energy-induced nuclear transformations, neutron properties, and applications of radio nuclides. Analyzes radiological safety nuclear instrumentation for particle detection, monitoring, and experimentation. Topics include the fission process and application; the classification, design, and application of nuclear reactors; nuclear fuel processing; and radioactive waste disposal. Includes supplementary lab experiments. *Prereq.* MTH 1195 and PHY 1196.

Computer Technology

CT 1105 Introduction to Programming 4 QH

Introduces Pascal as a solution to problems of using the computer. Topics include problem-solving, flow-charting, structured programs, loops, counters, and procedures. Utilizes the University's computer facilities to run program assignments. *Prereq.* None.

CT 1150 Computer Organization 4 QH

Introduces basic computer components. Discusses the function and basic operation of CPUs, main memory, and secondary memory and examines the functions of an operating system and its relationship with a program. *Prereq.* CT 1105 or CT 4105.

CT 1310 FORTRAN 4 QH

Presents FORTRAN 77 as a second language with emphasis on structured programming and modularity. Topics include lists, matrices, subroutines, functions, character-data manipulation, file processing, and documentation. Utilizes the University's computer facilities to run program assignments. *Prereq.* CT 1105 or CT 4105.

CT 1311 Programming with C Language 4 QH

Emphasizes writing programs in C, a general purpose programming language useable for operating systems or numerical, text-processing, and database programs. Assumes a basic knowledge of programming fundamentals. Topics include basic data types, operators and expressions, control flow (if/else, while, and others), functions and program structure, external variables, scope rules, pointers, address arithmetic, structure and union, and the C I/O library. *Prereq.* CT 1310 or CT 4310.

CT 1330 Data Structures 4 QH

Examines data, structures, storage, and manipulation and retrieval methods. Includes writing and running data manipulation programs using Northeastern's computer. Topics include stacks, queues, lists, trees, heaps, sets, graphs, searching,

sorting, key processing, and relational models. *Prereq.* CT 1311 or CT 4311.

CT 1333 UNIX Operating System 4 QH

Surveys advanced topics relevant to the UNIX operating and filing systems. Covers the differences between the AT&T and Berkeley versions of UNIX. Other topics include pipes, forks, excel, filter, signals, concurrency, processes, semaphores, EMACS, C pre-processor, macros, sed, grep, awd, make, gdb, dbx, lint, cb, lex, yacc, TeX, and shell programming. *Prereq.* CT 1330.

CT 1334 Object Oriented Programming 4 QH

Surveys the methodologies currently being used in object oriented programming languages. Reinforces concepts with case studies of Small Talk, Flavors, CLOS, and C++. Examines G-Base, an object oriented database system, and introduces the concepts of abstraction, polymorphism, class inheritance, locks, and generic dispatch. *Prereq.* CT 1330.

CT 1335 Numerical Algorithms 4 QH

Studies computer methods for solving mathematical problems. Involves writing and running application programs using Northeastern's computer. Topics include deterministic versus stochastic methods, random-number generators, iterative versus noniterative solutions, maxima and minima in two and three variables, curve fitting in two and three variables, integrals, trapezoidal and Simpson's rules, slopes, difference equations in two and three variables, vector and matrix algebra, simultaneous linear equations, nonlinear equations, permutations, and combinations. *Prereq.* CT 1310.

CT 1340 Software Engineering Design 4 QH

Offers structured methods for developing complex computer software. Provides students the opportunity to develop structured specifications, structured designs, and computer programs for complex problems and to test those programs using the University's computers. Topics include partitioning, hierarchical organization, data flow diagrams, data dictionaries, structured English, decision trees, decision tables, structured charts, team design, structured programs, and maintainability. *Prereq.* CT 1311 or CT 4311.

CT 1345 Assembly Language 4 QH

Studies a typical microprocessor assembly language. Includes writing and running homework problems on microprocessor-based systems. Topics include CPU and binary system programming model, instruction sets, addressing modes, binary operations, code conversion, subroutines, macros, and I/O. *Prereq.* CT 1150 or CT 4105 and CT 4150.

CT 1348 LISP 4 QH

Introduces an interactive language in which the LISP interpreter is commonly referred to as the read-evaluate-print loop. Discusses LISP's various levels of implementation in detail. Explores LISP as an excellent medium for implementing standard techniques in data-structure manipulation, techniques for recur-

sion, complex data structures, storage management, and symbol-table manipulation. *Prereq.* CT 1330 or CT 4330.

CT 1351 Advanced Computer Organization 4 QH

Examines the functional characteristics of complex and special-purpose computer systems, the functions of a general-purpose multiuser, and a multiprocessing operating system. Advanced topics include virtual memory and virtual machine architectures, distributed and multiprocessor systems, array processors, and system performance analysis. *Prereq.* CT 1356 and CT 1375 or CT 4356 and CT 4375.

CT 1355 Microprocessor Peripheral Hardware 4 QH

Considers the elements of microprocessor peripheral hardware and its interfacing. Covers designing and analyzing microprocessor systems, including detailed schematics, timing diagrams, and technical documentation. Topics include serial I/O devices, DMA and interrupt control devices, standard buses, bus arbitration techniques, and bus support VLSI. *Prereq.* CT 1374 or CT 4374.

CT 1356 Complex Peripheral Hardware 4 QH

Surveys the interfacing and implementation of complex peripheral systems including disc and tape interfaces, graphic display devices, communication interfaces and subsystems, and I/O processors. *Prereq.* CT 1355 or CT 4355.

CT 1360 Industry Software 4 QH

Surveys current commercial software packages and methods. Utilizes commercial packages implemented on Northeastern's computer where applicable. Topics include specific packages and methods including database management, scientific and statistical analysis, security and privacy, software assurance, and documentation. *Prereq.* CT 1330 and CT 1340 or CT 4330 and CT 4340.

CT 1363 Concurrent Programming 4 QH

Examines the principles of concurrent programming. Involves writing and running programs to demonstrate aspects of concurrent programming techniques and issues. Explores correctness of concurrent programs, material exclusion, the timing of Dekker's algorithms, the producer-consumer problem, monitors, semaphores, "Ada Rendezvous," critical regions, and conditional variables. *Prereq.* CT 1330 and CT 1340 or CT 4330 and CT 4340.

CT 1365 Industry Hardware 4 QH

Discusses the latest industrial developments and trends in computer hardware. Conducted as a seminar. *Prereq.* CT 1356.

CT 1368 Semiconductor Logic 4 QH

Analyzes the bipolar and MOS transistors in saturated and cutoff condition and implements these concepts to form basic logic and decision-making circuits. Demonstrates converting logical expressions into hardware configuration representations. Focuses on Ebers-Moll modeling, PMOS, NMOS, CMOS construction, and logic families. *Prereq.* EET 1311 or EET 4311.

CT 1369 Computer Logic 4 QH

Introduces the hardware building block of digital computers. Presents configurations of gates and memory components to achieve combinational and sequential composite logical functions. Discusses finite state machine design and analysis, gates, flip-flops, registers, decoders, ALU's, memory arrays, and synchronous and asynchronous state machines. *Prereq. CT 1368 or CT 4368.*

CT 1374 Introduction to CPU Hardware 4 QH

Introduces the circuits and operation of a microcomputer. Studies the microprocessor and its basic support components and circuits, including detailed timing and functional analysis of their interactions. Topics include central processing unit, memory, addressing, clocking, bus concepts, interrupts, co-processors, I/O, and instruction timing. *Prereq. CT 1345 or CT 4345 and CT 1368 or CT 4368.*

CT 1375 CPU Hardware Architecture 4 QH

Reviews high performance microprocessor architecture and hardware interfacing techniques. Analyzes current commercial processors and their support components. Focuses on internal CPU architecture, memory management, instruction prefetch, privilege states, bus cycles, control line, I/O, interrupts, and exceptions and pipelining. *Prereq. CT 1374 or CT 4374.*

CT 1377 VLSI Design 4 QH

Examines very large scale integration (VLSI) integrated circuits (ICs), the key components of all modern computers. Introduces MOS devices, circuits, design methods, and fabrication techniques used in producing custom VLSI ICs. Topics include MOS transistor characteristics, basic gate circuits, scaling, manual and automated layout tools, wafer-fabrication techniques, standards, testing, and costs. *Prereq. CT 1369 or CT 4369.*

CT 1379 Computer Networks 4 QH

Introduces the functional and operational aspects of computer networks. Topics include the ISO Reference Model's seven layers, ARPANET, DECNET, and SNA. *Prereq. CT 1380 or CT 4380.*

CT 1380 Data Communication Methods 4 QH

Introduces the ISO open systems interconnect model for communication system, and functional and operational aspects of data communication devices and software. Utilizes a black box approach. Examines modems, control units, multiplexers, concentrators, front end processors, and error checking. *Prereq. CT 1375 or CT 4375.*

CT 1381 Operating Systems 4 QH

Surveys the basic principles and organization of operating system implementation. Explores processor management; process multiplexing and synchronization; schedules; atomic operations and mutual exclusion; sequential and concurrent programming; memory; and device and data management. *Prereq. CT 1150 and CT 1311 or CT 4350 and CT 4311.*

CT 1382 Computer Graphics Programming 4 QH

Introduces generalized techniques for computer plotting of two- and three-dimensional shapes. Involves writing and running programs using the University's computer and digital plotter. Considers 2D and 3D transforms; 3D to 2D transforms; surface representation; shaping; hidden line; raster technology-color; introduction to interactive graphics characters; curve fitting; and graphic data structures. *Prereq. GET 1100 or CT 1310 or GET 4100 or CT 4310.*

CT 1383 Databases 4 QH

Examines database organization structure and management. Utilizes the University's computer to write and run programs exemplifying techniques developed in class. Covers access methods, attributes, indices, keys, querying, searching and matching, file sets, inverted file sets, normal forms, and random access. *Prereq. CT 1330 or CT 4330.*

CT 1384 Large System Assembly Languages 4 QH

Utilizes VAX-II assembly language macro to show how basic components in the CPU are used during program execution. Emphasizes integer, real, and character instruction sets; various address techniques; procedure linkage; and main and system I/O. Utilizes the University's computer facilities to run program assignments. *Prereq. CT 1345 or CT 4345.*

CT 1385 Introduction to Simulation Programming 4 QH

Focuses on computer methods for solving simulated phenomena. Involves writing and running programs implementing simulations specified by instructor. Explores simple queues; multiserver queues; priorities, including first in first out, last in last out, and time aging of data; simple frequency distributions; use of SIMULA, GPSS, and standard Subroutine Library Routines. *Prereq. CT 1335.*

CT 1386 Development System Hardware 4 QH

Studies the principal hardware capabilities and current trends in microcomputer level system. Includes both single users and network-oriented system. *Prereq. CT 1375.*

CT 1387 Bit-Slice Microcomputers 4 QH

The epitome of hardware flexibility is represented by the bit-slice CPU. Demonstrates the basic design ground rules common to this style of hardware design. *Prereq. CT 1355 or CT 4355.*

CT 1388 Micro Controllers 4 QH

The commercial segment of microcomputers has been satisfied by a variety of single-chip 4-bit micro controllers. A detailed contrast/comparison will be done on several of these devices, including the IMS-1000, S2000, COPS, and PPS-4. *Prereq. CT 1374.*

CT 1389 Single-Chip Microprocessors 4 QH

When small 8-bit intelligent devices are rewired in high volume, the single-chip microprocessor in the form of the 3870, 8084 Z8, and others comes into play. An understanding of the hardware limitations of a single-chip system presents the basis for this subject material. *Prereq. CT 1374 or CT 4374.*

CT 1390 Special Problems in Computer Technology 4 QH
Theoretical or experimental work under individual faculty supervision.

CT 1395 Computer Security 4 QH
Focuses on issues related to security in computing, including the history of security, encryption techniques and applications, secure communications, and software protection. Covers software verification and validation, security design in hardware, and products currently available for recurring systems and data. Discusses privacy as well as reliability. *Prereq.* CT 1380 or CT 4380.

CT 1396 PROLOG: An Introduction to Artificial Intelligence 4 QH

Introduces fundamental artificial intelligence (AI) terms and techniques using PROLOG as a programming language. Topics include knowledge representation, search, parsing, logic, and inference techniques. Uses student projects as an integral part of the course. *Prereq.* CT 1330 or CT 4330.

Electrical Engineering Technology

EET 1151 Circuit Analysis I 4 QH
Examines Ohm's law, Kirchhoff's current and voltage laws, equivalent resistances and sources, mesh and modal analysis, network theorems, two-port networks and power relations—all with respect to direct currents. Topics include energy storage, singularity functions, response of R, L, and C elements to singularities. *Prereq.* MTH 1193 and PHY 1193.

EET 1152 Circuit Analysis 2 4 QH
Studies complex algebra, phasors, frequency domain, mutual inductance, transformers, steady-state AC theory, driving point and transfer impedances. Topics include power and energy in AC circuits, Laplace transforms, partial fraction expansion, and Laplace transform techniques applied to the solution of RLC networks. *Prereq.* EET 1151.

EET 1310 Electrical Measurements 4 QH
Covers standards of measurements, dimensional analysis, errors and measurement of dispersed data, discrete and continuous variables, binomial distribution, and normal distribution. Topics include guaranteed error, methods of resistance measurements, digital voltmeters and analog-to-digital conversion, voltage references, and potentiometers and AC bridges. *Prereq.* EET 1353.

EET 1311 Electronics I 4 QH
Discusses semiconductor diodes and applications, transistor-biasing techniques, graphical analysis of basic amplifiers, and DC and AC load lines. *Prereq.* EET 1152.

EET 1312 Electronics 2 4 QH
Investigates small-signal, low-frequency transistor models, gains and impedances at midband, frequency effects in transistor circuits, multistage circuits, and transistors used as current sources. *Prereq.* EET 1311.

EET 1313 Electronics 3 4 QH
Reviews of Bode plots, transistor circuits at low and high frequencies, feedback operational amplifiers, differential amplifiers, and applications. *Prereq.* EET 1312.

EET 1314 Pulse and Digital 1 4 QH
Covers switching characteristics of semiconductor devices, wave generation and shaping, and using combinations of passive and integrated circuit components. Studies comparators, hysteresis, dual ramp analog-to-digital converter-voltmeter circuits, and voltage-to-frequency conversion. *Prereq.* EET 1311.

EET 1315 Pulse and Digital 2 4 QH
Examines digital operations, logic statements and theorems, minimization of logic functions, logic gates and the characteristics of the integrated logic families, flip-flops, counters, and registers. Introduces sequential circuit design, sample and hold circuits, and analog-to-digital conversion. *Prereq.* EET 1314.

EET 1317 Principles of Communication Systems 1 4 QH
Focuses on signal analysis using Fourier methods, noise in communication systems, frequency selective amplifiers, including wideband, transistor power amplifiers AF and RF, oscillators, and signal sources and applications. *Prereq.* EET 1313.

EET 1318 Principles of Communication Systems 2 4 QH
Explores basic theory of amplitude, frequency, phase and pulse code modulated systems, analysis of modulating and demodulating circuits. Topics include carrier systems using SSB, system block and level diagrams, logic control circuits in communication systems, and modems. *Prereq.* EET 1317.

EET 1319 Principles of Communication Systems 3 4 QH
Emphasizes the fundamentals of digital communications, sampling requirements, analog-to-digital conversion methods, and system capacity and bandwidth. Topics include comparison of practical digital systems PAM, PCM, PFM, PWM, time and frequency division multiplexing, data decoding, and selected examples from telemetry and computer links. *Prereq.* EET 1318.

EET 1320 Electricity and Electronics 1 4 QH
Introduces circuit analysis, resistive networks, periodic excitation function, steady-state AC circuits, the physical foundations of electronics, and the physical operation of electronic devices. *Prereq.* MTH 1193 and PHY 1193.

EET 1321 Electricity and Electronics 2 4 QH
Examines single-stage electronic circuits, magnetic circuits and transformers, electro-mechanical energy conversion, DC machines, and AC machines. *Prereq.* EET 1320.

EET 1323 Electronic Laboratory 2 QH
Offers experiments demonstrating lab equipment (meters and oscilloscopes) techniques, junction and field-effect transistor characteristics, vacuum and semi-conductor diodes, power supplies, including the regulated type. Topics include silicon-controlled

rectifiers, and resistance-coupled amplifiers using transistors, including feedback methods. *Prereq. EET 1312 or concurrently.*

EET 1324 Circuits Laboratory 1 **2 QH**
Offers experimentation in electronic circuit theory utilizing various measurement techniques. Topics include instrumentation verification of circuit theorems, response of circuits to steps and impulses, and oscilloscope theory and applications. *Prereq. EET 1151.*

EET 1325 Circuits Laboratory 2 **2 QH**
Offers further experimentation in electrical circuits and measurement techniques. Experiments include response of circuits to steps and impulses, nonlinear devices, terminal characteristics of active devices, log modulus plots, network parameters and synthesis, and Fourier analysis and synthesis. *Prereq. EET 1324.*

EET 1327 Advanced Electronics Laboratory 1 **2 QH**
Offers experiments using oscilloscopes, the examination of transistor audio amplifiers, push-pull amplifiers, drivers, pulse and video amplifiers. Topics include transients and wave-shaping circuits, audio frequency oscillators, and the study of operational amplifiers. *Prereq. EET 1323.*

EET 1328 Advanced Electronics Laboratory 2 **2 QH**
Experiments with the modulation of a class C amplifier, the diode detector, basic timing circuits, RF and crystal oscillators, astable multivibrators, logic gates, flip-flops, binary adders, registers and counters. Topics include active filters, frequency modulation detectors, and analog-to-digital and digital-to-analog conversion. *Prereq. EET 1327.*

EET 1329 Advanced Electronics Laboratory 3 **2 QH**
Studies FM and PM waves, amplitude limiters, the balanced modulators and single sideband generators. Discusses integrated circuit timers and monolithic random access memory, and monolithic phase-locked loop, as well as a series of microwave experiments and digital experiments. *Prereq. EET 1328.*

EET 1330 Energy Conversion **4 QH**
Investigates generalized theory of rotating energy conversion devices, steady-state operation of the multiply-excited direct-current machine, control of speed, special machines, transformers, steady-state considerations of induction and synchronous machines. Explores the generalized machine and circuit model, and Laplace transform techniques applied to the analysis of dynamic operating modes of rotating machines. *Prereq. EET 1152 and MTH 1195.*

EET 1337 Distributed Systems **4 QH**
Examines radiation, transmission, and reception of electromagnetic waves, distributed-line constants and traveling waves of transmission lines, and differential equations of the uniform line. *Prereq. MTH 1195 and PHY 1193.*

EET 1353 Circuits Analysis 3 **4 QH**
Applications of differential equations to the solutions of linear, and time-invariant electrical networks. Introduces to singularity functions, convolution, and time-domain transient analysis, network topology and duality, and the methods of transformation calculus and complex frequency concepts. *Prereq. EET 1152.*

EET 1354 Circuits Analysis 4 **4 QH**
Focuses on signal analysis in the frequency domain, Fourier series, Fourier and Laplace transform methods, and a varied selection of circuit problems using Laplace transforms and related theorems. *Prereq. EET 1353.*

EET 1360 Engineering Analysis 1 **4 QH**
Studies linear algebra and circuit equation applications, as well as solution of linear differential equations, including an introduction to Laplace transforms. *Prereq. EET 1152 and MTH 1195.*

EET 1362 Basic Power Systems 1 **4 QH**
Focuses on power transmission lines, line constants, current voltage and power relations, electric-power distribution loads, feeders, and substations, and application of matrices. *Prereq. EET 1354.*

EET 1363 Basic Power Systems 2 **4 QH**
Investigates symmetrical and asymmetrical faults, protective devices — application and coordination, power flow in electric circuits, steady-state power limitations of systems, and voltage regulation theory and application. *Prereq. EET 1362.*

EET 1364 Basic Power Systems 3 **4 QH**
Offers computer applications to power systems with emphasis on load-flow studies, basic ideas of systems planning, short-circuit studies, and system stability. *Prereq. EET 1363.*

EET 1370 Digital Computers 1 **4 QH**
Introduces digital computer design. Topics include general computer organization, number systems and number representations, design characteristics of major computer units, and Boolean algebra applications to computer design. *Prereq. EET 1311.*

EET 1371 Digital Computers 2 **4 QH**
Examines microprocessor architecture and organization. Studies the machine language and assembly coding of an industry-accepted microprocessor, and a suitable topic from the current literature. Assembly language coding problems assigned. *Prereq. EET 1370.*

EET 1377 Control Engineering 1 **4 QH**
Analyzes linear servomechanisms under both transient and steady-state conditions, signal flow graphs, and Laplace transforms in the formulation of block diagrams and transfer function. *Prereq. EET 1354 and MTH 1195.*

EET 1378 Control Engineering 2 **4 QH**
Focuses on system stability, root locus techniques, and treatment of Nyquist criteria and Bode diagram methods for systems evaluation. *Prereq. EET 1377.*

EET 1390 Optical Instrumentation**4 QH**

Focuses on telescopes, microscopes, and similar equipment, as optical system components. Includes magnification, aberrations, resolution criteria, photometry, compatibility of system components and optimization of systems, and the basic nonimage-forming systems used for analysis control and metrology. *Prereq.* MTH 1192 and PHY 1193.

EET 1399 Special Problems in Electrical Engineering Technology**4 QH**

Offers theoretical or experimental work under individual faculty supervision. *Prereq.* Consent of department chair.

General Engineering Technology**GET 1100 Computer Programming for Engineering Technology****4 QH**

Introduces computers for problem solving using FORTRAN 77. Topics include flowcharts, DO loops, arrays, subroutines, functions, and character manipulations. Students use the University's computer facilities to run programs. *Prereq.* MTH 1191 or MTH 4107 or taken concurrently.

GET 1170 Engineering Graphics 1**4 QH**

Introduces manual and computer engineering drawing using geometric constructions, charts, and graphs. Geometric construction includes descriptive geometry, orthographic projection, sections, and isometric drawing. *Prereq.* None.

GET 1171 Engineering Graphics 2**4 QH**

Studies computer and manual drawing in layout and assembly graphics. Topics include manufacturing processes, fasteners, gears, welding, electric/electronic drawing, architectural/structural drawing, piping, and topography. Design project required. *Prereq.* GET 1170 or equiv.

GET 1172 Electrical Engineering Graphics**4 QH**

Introduces electronic graphics, including symbols, schematics, block and logic diagrams, production and cable drawings, and military standards. Studies single- and double-sided printed circuit layout, integrated circuits, electromechanical designs, wiring, interconnection diagrams, and graphical data presentation. *Prereq.* GET 1170 or equiv.

GET 1356 Engineering Economy**4 QH**

Presents fundamental accounting concepts and terminology, including assets, liability, net worth, and analyzing income statements and balance sheets. Discusses introductory steps in analyzing investment proposals, time value of money, and cash flows. Analyzes cash flows in terms of present worth, annual worth, rate of return, and benefit/cost ratio. Considers depreciation and tax effects on cash flows. *Prereq.* MTH 1191.

GET 1364 Kinematics**4 QH**

Studies four-bar linkages, sliders, and others, using orthogonal components of vectors, instantaneous centers, equivalent linkages, effective cranks, and so on, emphasizing graphical solutions, including an

introduction to the computer to enhance these concepts. Analyzes reverted and epicyclic gear trains, cam displacement, velocity, and acceleration diagrams. *Prereq.* GET 1171, PHY 1191, or equiv.

Mechanical Engineering Technology**MET 1301 Mechanics A****4 QH**

Explores forces, moments, couples, statics of particles, and rigid bodies in two- and three-dimensions. Examines external and internal distributed forces, first moments and centroids, and structures such as trusses, frames, and machines. *Prereq.* MTH 1193; or MTH 4120; PHY 1191 or PHY 4117.

MET 1302 Mechanics B**4 QH**

Emphasizes friction, second moments, virtual work, kinematics of particles, rectilinear and curvilinear motion of dynamic particles. Topics include force, mass and acceleration, and work and energy. *Prereq.* MET 1301 or MET 4301.

MET 1303 Mechanics C**4 QH**

Studies impulse and momentum of particles. Topics include kinematics and dynamics of rigid bodies: force, mass, and acceleration; dynamics of rigid bodies: work and energy, and impulse and momentum; and introduction to mechanical vibration. *Prereq.* MET 1302 or MET 4302.

MET 1314 Stress Analysis A**4 QH**

Investigates axially loaded members, stress and strain, allowable stresses, factor of safety, temperature effects, indeterminate members and thin-walled pressure vessels. Topics include centric loading of bolted and welded connection, shear and moment in beams, eccentrically loaded connections, and flexural and transverse shearing stresses in beams. *Prereq.* MET 1301 or MET 4301.

MET 1315 Stress Analysis B**4 QH**

Discusses determinate and indeterminate beam deflections and reactions by numerical and graphical integration and area moment methods, theorem of three moments and torsional stresses and strains. Topics include power transmission, eccentric loads on struts, beams, riveted and welded joints, combined and principle stresses, Mohr's circle, and theories of failure. *Prereq.* MET 1314 or MET 4314.

MET 1319 Mechanics**4 QH**

Examines kinematics of particles, especially rectilinear and curvilinear motion of dynamic particles. Considers force, mass, acceleration, work, and energy. Discusses impulse and momentum of particles, and kinematics and dynamics of rigid bodies: force, mass, and acceleration. Also examines the dynamics of rigid bodies: work and energy, and impulse and momentum. *Prereq.* MTH 1193 and PHY 1191.

MET 1330 Mechanical Design A**4 QH**

Introduces mechanical design, the design process, design factors, creativity, optimization, human factors, and value engineering. Discusses and develops principles through simple design projects. Topics

include principles of design, properties and selection of materials; stress concentrations; strength under combined stresses; theories of failure; and impact, fluctuation, and repeated loads. *Prereq. MET 1315 or MET 4315; MET 1380 or MET 4380.*

MET 1331 Mechanical Design B

4 QH

Explores stresses, deformation and design of fasteners, screws, joints, springs, and bearings, lubrication, and journal bearings. Topics include stresses and power transmission of spur, bevel, and worm gear, shaft design, and clutches and brakes. *Prereq. MET 1330 or MET 4330.*

MET 1340 Thermodynamics A

4 QH

Introduces general theory of heat and matter, laws of thermodynamics, energy-transformation principles, availability of energy, properties and processes for pure substances and ideal gases. Topics include thermodynamic properties and processes of liquids and vapors, tables and charts, mixtures of fluids, and vapor cycles. *Prereq. PHY 1192 or PHY 4118.*

MET 1341 Thermodynamics B

4 QH

Discusses theory of vapor engines and analysis of actual engine types using gas and vapor compression, internal combustion engines, theory of gas and vapor flow through orifices and nozzles, and principles of gas compression. Includes analysis of vapor compression, refrigeration systems, low-temperature refrigeration cycles, and absorption refrigeration systems. *Prereq. MET 1340 or MET 4340.*

MET 1342 Refrigeration and Air-Conditioning

4 QH

Focuses on air-conditioning principles, including psychometrics and heat pumps. Examines calculation of heating and cooling loads in accordance with ASHRAE practices, principles of gas compression, analysis of vapor compression, refrigeration systems, low-temperature refrigeration cycles, and absorption refrigeration systems. *Prereq. MET 1341 or MET 4341.*

MET 1343 Heat Transfer

4 QH

Studies the primary modes of heat transfer, thermal conductivity, thermal conductance/resistance concept, thermal-electrical analogy, combined heat-transfer mechanisms, and basic equations of conduction. Investigates analytical solutions of various steady-state conduction problems. Also covers dimensional analysis and similarity considerations, natural and forced convection, hydrodynamic and thermal boundary layers, black-body radiation, Kirchhoff's law, emissivity and absorptivity, radiation between simple bodies, numerical methods, log mean temperature differences, and overall heat transfer coefficients. Topics include heat exchanger effectiveness, tubular exchanger design, regenerative and evaporative heat exchangers, and heat transfer engineering problems. *Prereq. MET 1341 or MET 4341.*

MET 1370 Fluid Mechanics A

4 QH

Investigates hydrostatics, principles governing fluids at rest, pressure measurement, hydrostatic forces on

submerged areas and objects, and simple dams. Topics include fluids in moving vessels, hoop tension fluid flow in pipes under pressure, fluid energy, power, and friction loss, Bernoulli's Theorem, and flow measurement. *Prereq. MET 1302 or MET 4302.*

MET 1371 Fluid Mechanics B

4 QH

Explores pipe networks and reservoir systems, flow in open channels, uniform flow, energy, friction loss, minor losses, and velocity distribution. Topics include alternate stages of flow, critical flow, non-uniform flow, accelerated and retarded flow, and hydraulic jump and waves. *Prereq. MET 1370 or MET 4370.*

MET 1380 Materials A

4 QH

Introduces fundamental metallic structures, general metallurgical information covering theoretical aspects of properties, testing, and failure of metals. Supplemented by visual aids. Topics include alloying and hardening of metals, refinement of metals, equilibrium diagrams, characteristics of engineering metals, and principles of metal fabrication.

MET 1390 Measurement and Analysis Laboratory

2 QH

Offers experiments for the collection and analysis of data by graphics and numerical methods including computer applications, report writing that draws conclusions relative to accuracy, precision, true values, and measured values as they relate to basic mechanical measuring instruments for length, area, volume, specific gravity, pressure, temperature, and time as these parameters are utilized in making mechanical measurements. *Prereq. GET 1100 or GET 4100; MET 1314 or MET 4314; MTH 1195 or MTH 4122; and PHY 1193 or PHY 4119.*

MET 1391 Technology Laboratory A

2 QH

Presents experiments to determine mechanical properties of materials under tensile, compressive, torsional, direct shear, flexural, impact, fatigue, and creep loading conditions as they are affected by normal and abnormal environmental conditions; also as they are affected by homogeneity, nonhomogeneity, isotropy, and nonisotropy. *Prereq. MET 1315 or MET 4315; MET 1380 or MET 4380; MET 1390 or MET 4390; or concurrently.*

MET 1392 Technology Laboratory B

2 QH

Offers experiments to determine the physical properties of incompressible fluids and to measure the flow rates and velocities utilizing pilot tubes, orifice plates, venturii and weirs flow meters, U-tube differential manometers, and piezometers as the fluid flows through open channels, partially filled conduits, conduits under pressure, pipe networks, turbines and pumps. *Prereq. MET 1390 or MET 4390; MET 1370 or MET 4370; or concurrently.*

MET 1393 Technology Laboratory C

2 QH

Explores basic thermodynamic relations. Experiments examine the flow of compressible fluids and steam and the energy conversion of a fuel into a working substance and the related heat-transfer mechanisms. Discusses operating characteristics of

thermal generators, engines, and compressors. *Prereq. MET 1390 or MET 4390; MET 1341 or MET 4341; or concurrently.*

MET 1394 Technology Laboratory D

2 QH

Presents experiments to examine the operating characteristics and efficiencies of internal combustion engines, brake horsepower, indicated horsepower, friction horsepower, and mean effective pressure. Topics include fuel consumption, torque, ignition timing, manifold pressure, and compression ratios and internal engines as energy conversion systems, and energy conversion of fuels. *Prereq. MET 1341 or MET 4341; MET 1343 or MET 4343; MET 1393 or MET 4393; or concurrently.*

MET 1395 Technology Laboratory E

2 QH

Offers experiment, analytical, and design projects to examine refrigeration, air conditioning, and heating pump cycles. *Prereq. MET 1342 or MET 4342; MET 1343 or MET 4343; and MET 1390 or MET 4390.*

MET 1396 Machine Shop

4 QH

Introduces the study of machines for metal processing, cutting tools, and fluids, machinability, and automatic machinery.

MET 1414 Mechanical Vibrations

4 QH

Examines elements of vibrating systems, one degree of freedom (undamped free and forced vibration from Newton's law of motion and energy methods), natural frequencies, and damped free and forced vibration. Topics include impedance and mobility, systems with more than one degree of freedom; influence coefficients, Lagrange's equations, generalized coordinates, and vibration absorber. *Prereq. MET 1303 or MET 4303.*

MET 1415 Experimental Stress Analysis

4 QH

Explores theory and experimentation showing the application of extensometers and electrical strain gauges as transducers in the field of experimental stress and strain analysis. Presents theory and lab practice on photoelastic methods as applied to classical model analysis and modern coating analysis. *Prereq. MET 1315 or MET 4315.*

MET 1416 Stress Analysis C

4 QH

Discusses curved beam, asymmetrical bending of beams, shear-center and shear stresses on thin sections, composite beams; columns energy absorption and resilience, inertial stresses, impact loading, and deflection of beams by energy methods. *Prereq. MET 1315 or MET 4315.*

MET 1444 Power Generation

4 QH

Examines basic power generation cycles; gas turbine cycles; effects of combustor temperature, intercooling, and such, on cycle performance; Rankine

regenerative cycles, effects of steam temperature, pressure, number of feedwater heaters, and so on, upon performance; steam generation equipment; boilers; reactors. Considers fossil fuel characteristics and effects on boiler design; combustion analysis; draft calculations, axial and centrifugal fan performance characteristics; pump design and performance consideration; heat-exchanger design considerations. Topics include applications of principles of economics to cycle and performance considerations use of load curves; economic considerations of heat rate; economics of equipment selection; and study of auxiliary equipment such as precipitators and flue-gas desulfurization systems. *Prereq. MET 1341 or MET 4341.*

MET 1481 Materials B

4 QH

Focuses on the study of inorganic materials (polymers, glasses, ceramics, cements, wood), and materials having important electrical and magnetic properties. A summary of the most recent applications for the fabrication and uses of both metals and nonmetals. Structures of metals, imperfections, phase diagrams effect of temperature on structure and properties of metals (annealing, recrystallization, recovery, precipitation, diffusion) strengthening mechanisms, mechanical properties of nonferrous metals. Lab experiments in preparation of samples, selection, polishing, and etching; examination of nonferrous metals, use of the microscope, linear analysis construction of cooling curves, and simple binary-phase diagrams. *Prereq. MET 1380 or MET 4380.*

MET 1482 Applied Metallurgy

4 QH

Investigates mechanical properties of ferrous metals; the iron-carbon diagram; high-temperature alloys, hardening methods, impact tests, and effects of environment on metals. Manufacturing processes: methods of fabrication, limitations on the use of different materials and their processing, casting, welding, cutting, drawing, and powder metallurgy. Lab experiments on analysis of stress-strain diagrams of iron and steel, heat treatment of steels, surface corrosion, tempering and drawing, and the use of metallograph and analysis of the results. Experiments in cold rolling, swagging, and drawing of nonferrous metals and analysis of the results. Tension, shear, fatigue, and machinability tests on ferrous metals. *Prereq. MET 1481 or MET 4481.*

MET 1499 Special Problems in Mechanical Engineering Technology

4 QH

Theoretical or experimental work under individual faculty supervision. *Prereq. Consent of department chair.*

African-American Studies

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Office of the Dean before taking the course.

Numbers in parentheses within course descriptions refer to core curriculum categories listed on page 2.

AFR 1100 Introduction to African-American Studies 4 QH

Explores several of the possible historical, sociological, cultural, and political avenues of study in the broad interdisciplinary spectrum of African-American studies. Provides an introductory overview of the field and will offer an opportunity to identify areas for more specific focus.

AFR 1115 Epidemiology of Black Diseases 4 QH

Introduces the science of epidemiology, the study of the occurrence of disease in populations. Explores the concepts, principles, and methods of epidemiological analysis, with emphasis on specific diseases occurring with greater frequency in urban and black populations, such as cardiovascular conditions, sickle cell disease, and certain occupational and environmental illnesses.

AFR 1127 African-American Literature 1 4 QH

Offers a survey of African-American literature from the period of slavery to the present, with an emphasis on literature concerning the relation between the rise of the black American and the development of African-American literature. The black experience as it is revealed in literature will be important in the discussion.

AFR 1131 African-American History 1 4 QH

Covers the development of black America from the period of slavery through Reconstruction, with emphasis on the historical links between Africa and America and the impact on black development in the United States. (III)

AFR 1132 African-American History 2 4 QH

Examines the development of black America from Reconstruction to the present, and the effects of events in the United States and world history on the development of black America. Emphasizes contemporary issues and how these issues can be seen through a historical perspective. *Prereq.* AFR 1131 or permission of instructor.

AFR 1133 History of Blacks in the Media and the Press 4 QH

Offers a historical and visual examination of the development of the African-American experience in the American mass media and press. Analyzes contemporary and historical literature, films, and people with respect to history, racism, images, psychology, and social movements. Newspapers, film, television, and radio are prime focal points, and are used to help form strategies for the future of black Americans.

AFR 1141 Education Issues and Minority Communities 1 4 QH

Focuses on some of the important issues in today's urban elementary and secondary education systems. The analysis will look at the historical development of these issues, and students will be encouraged to think about and discuss the issues' future significance.

AFR 1150 Black Cultural Development in the United States 4 QH

Focuses on the rise of a distinctive black culture in the United States, with emphasis on examining the premise that the black population in America has developed a cultural system that operates as a sub-system of the American cultural norm.

AFR 1151 Survey of African-American Art 4 QH

Black art, like black literature, has always been an important aesthetic social statement by the African-American artist. This course offers a historical and critical examination of African-American art from the nineteenth century to the present, with special emphasis on the effects of European and African art styles on the black artist in America.

AFR 1153 Survey of African-American Music 4 QH

Black music has evolved in fascinating ways over the past hundred years. Topics include the impact of African rhythm on black music, the New Orleans coalescence, regional development, ragtime, the emergence of large bands, the harmonic revolution of the forties, bebop, the 1960s avant-garde, and subsequent developments. Some analysis of specific jazz phenomena is included. This is the same as MUS 1104.

AFR 1156 Music of Africa 4 QH

The music of Africa is as varied as that continent's many linguistic and tribal identities. This course will provide a broad survey of the musical traditions of Africa with respect to their historical, social, and cultural backgrounds. Musical organization, musical practice, and aspects of style will all be discussed in light of possible contributions to contemporary African-American music. Same as MUS 1181.

AFR 1161 Economic Issues in Minority Communities 4 QH

Minority lifestyles, perspectives, self-images and social position in the urban community are all affected by economic factors, especially those specific to the minority poor. Students have the opportunity to examine these issues, particularly in terms of the application of basic economic theories to the economic realities of minority communities. (VI)

AFR 1171 Survey of Contemporary Black Political Movements 4 QH

The modern black political movements were inspired by a full-scale evolution of black political thought in America. Analysis of this evolution examines socio-political contests that have served as catalysts to these modern movements.

AFR 1191 Early African Civilization 4 QH

Studies the ancient empires of Africa, especially Ghana, Songhai, Mali, Zimbabwe, the city states of East Africa, and also the Congo Kingdom. Includes Ethiopian as well as Egyptian history and controversies to 1800.

AFR 1193 Africa Today 4 QH

With increasing numbers of nations striving for economic and political control in Africa, and with imperialist and colonial ideas remaining in the living memory of Africans, Africa presents a complex political and social picture to the rest of the world. This course examines some of the salient features of black art, politics, and identity in Africa.

AFR 1195 Identity and Nationalism in Africa 4 QH

How have centuries of imperialism, the struggle for national unity, and the continuing problems of racism and rivalry between factions affected the present identities and nationalist movements in Africa? This course explores problems peculiar to Africa and to any group of nations struggling against colonial ideas. Tribalism and the effects of European colonial partition on African identity are discussed.

AFR 1196 The Black Experience in the Caribbean 4 QH

Offers a descriptive and interpretive analysis of the growth of the modern black community in the Caribbean. Although the focus will be on the contemporary period, the course will examine that period in the context of colonialism and slavery in the Americas. Important racial, social, political, economic, and religious issues will be addressed.

AFR 1197 Modern African Civilization 4 QH

Explores African history and culture from 1800 to the present era. Emphasis will be placed on the relationship between Europe and Africa, the circumstances surrounding the imperialist partition of Africa, and the decolonization process. This course is the same as HST 1621. (IV)

AFR 1211 African-Americans in Science, Technology, and Medicine 4 QH

Studies the contributions that African-Americans have made to the development of science and technology in America. It examines the cultural and social factors that have encouraged blacks to work in the fields of science (biology, chemistry, physics) and technology (engineering and medicine). Certification of blacks within the American scientific community and the availability of science to the past and contemporary African-American communities are also explored. Readings, discussions, individual research topics, and interviews with black scientists, inventors/engineers, and doctors are used to develop the basic course material.

AFR 1214 Poverty and Health Care 4 QH

Why do the poor fail to get good health care? The course discusses problems of the poor and will examine the entire health care system, including Blue Cross and Blue Shield, Medicare and Medicaid, National Health Insurance, low-income barriers to health care, and future directions of medical care.

AFR 1220 The Black Novel 4 QH

The black novelist belongs to a unique literary group in the history of American fiction. Special attention is given to Chesnut, Toomer, Wright, Ellison, and contemporary novelists, and to their different perceptions of the black experience in America.

AFR 1223 Black Poetry 4 QH

Black poetry has been an important describer of the black experience in American thought through three centuries. This course will survey the black American poet from colonial times to the present. Special attention will be given to major poets and the influences that shaped their works.

AFR 1235 Black History of Boston 4 QH

Examines the social, economic, political, and educational history of Boston's black community in the nineteenth and twentieth centuries. The development of the black community and its institutions is a major focus, and students are encouraged to study the past in an attempt to understand the present and interpret the future. Research data include participant observation, oral history, interviews, and primary and secondary source materials.

AFR 1240 Contemporary Issues in Black Society 4 QH

Introduces the various issues and problems that confront black Americans, including some of the realities of the social, political, and economic problems of contemporary black experience. Students are asked to assess the validity of specific social theories in relation to the black experience.

AFR 1241 The Black Family 4 QH

How does the black family function, both interpersonally and as a social unit? Anthropological and sociological theories deal with variations in family structure and the function of the black family in black society. The effects of slavery and colonization on the black family structure and functions are also explored. A side issue is a discussion of some of the differences and similarities between African, African-American, and African-Caribbean families.

AFR 1248 Race Relations in America 4 QH

Examines the interrelations of ethnic, cultural, and minority groups in the United States. Focus is on the nature of racial conflicts, discrimination, reverse discrimination, personal and institutional racism, and racial and ethnic stereotyping. Discussion considers avenues of improvement in attitude awareness and change.

AFR 1251 Survey of Black Theater and Drama 4 QH

Theater in America has been an important reflector of the national experience, and black theater, especially in recent years, has served the same purpose for the black community. The course focuses on the

development of black drama during the nineteenth and twentieth centuries, with emphasis on modern developments and their political and cultural significance.

AFR 1261 The Economics of Urban Poverty 4 QH

Like most Americans and people from around the world, blacks migrated to central cities in America to better their economic conditions. However, unlike other migrants to urban centers, they were not assimilated into the social/economic mainstream, and there is evidence of flagrant job, housing, and educational discrimination against them even during periods of affluence. During recession or depression, their problems were compounded. Students have the opportunity to survey the above events from an economic framework.

AFR 1274 Black Political Behavior 4 QH

Examines the social and psychological dynamics of black political participation. Main issues of the course include identity and political socialization and their impact on black voter turnout and partisan choices.

AFR 1280 Black Psychological Identity 4 QH

So much is said of stereotyping in news, on television programs, and in literature. The shaping of the black identity over three centuries in America is a complicated and perhaps even elusive problem. This course will look at the impact of slavery, racism, war, and poverty on the evolution of the black identity in America.

AFR 1294 Third World Political Relations 4 QH

Offers a comparative regional analysis of the political systems of third world nations of Africa, Asia, Latin America, and the Caribbean. Emphasis is on development strategies; problems of development, including national identity, political socialization and participation, national defense, and urbanization; and the positions of third world nations in the international community.

AFR 1297 Caribbean History 4 QH

Analyzes the development of the Caribbean from slavery to the present. The focus will be on the period 1918–1962 especially, and emphasis will be on the historical analysis of the relationship of the Caribbean with the United States and black Americans.

AFR 1300–AFR 1311 Directed Study 4 QH

Directed study offers the ambitious student the opportunity to pursue a special intellectual interest not covered by the department course offerings and to work on this interest with the department faculty member of his/her choice. The faculty member will closely supervise the project and act as adviser for the duration of the quarter.

AFR 1350 Research Seminar 4 QH

This course is divided into three parts, providing students the opportunity, first, to identify a substantive area of their concern (for example, welfare, political leadership, education) and to define a related problem in a research context; second, to be supervised

in designing a research methodology most appropriate for examining the problem area; and third, to conduct extensive research, test the hypothesis, and draw conclusions based on data analysis techniques.

AFR 1355 Directed Study for Senior Thesis 4 QH

The senior thesis is required of all African-American Studies majors; it offers students the opportunity to prepare a professional research paper under the close supervision of a scholar interested in students' particular research areas. *Prereq.* *Permission of instructor.*

AFR 1360 Field Research Seminar 4 QH

Seniors have the opportunity to work with a faculty member on an individual basis, while carrying out a particular research project off-campus. Students are required to refine and polish a topic and outline for the senior thesis. *Prereq.* *Permission of instructor.*

AFR 1380 Junior/Senior Honors Program 4 QH

For details contact the Honors Office, 183 Holmes.

AFR 1401 History of East Africa 4 QH

The first section of the course deals with the pre-colonial period and the problems of the partition of Africa. The second section focuses on the classical colonial period and the transformations of colonial policy after World War II, with particular emphasis on the ambiguity of decolonization and those features of the colonial system that seem to have become a part of the East African social and political environment.

AFR 1403 History of West Africa 4 QH

The history of West Africa has included the struggle for internal unity, economic development, and social justice. The Pan-Africanist ideology, W.E.B. DuBois's writings, African socialism, and the consolidation of power and leadership are some of the topical objectives in this study of African liberation, particularly the rise of West Africa.

AFR 1405 History of South Africa 4 QH

Initial attention is directed toward pre-colonial South Africa and the conflict between Africans and the Dutch and English settlers. The course then focuses on the formation and transformation of colonial policy after World War II, with particular emphasis on racism, neo-colonialism, liberation movements, and international involvement in the apartheid system. (VI) *Prereq.* *AFR 1491 or permission of instructor.*

AFR 1421 African-American Literature 2 4 QH

Continues AFR 1127. Focuses on principal writers and their major themes. *Prereq.* *AFR 1127 or permission of instructor.*

AFR 1431 Analysis of the Slavery System in America 4 QH

Attempts a comprehensive survey of the realities of the slavery system in America, with focus on the impact of slavery on blacks as well as on the society that perpetrated the system. Examination of slave narratives and other historical documents will provide insights into the origin of the slavery system and the way it functioned until the Emancipation Proclamation.

AFR 1432 Analysis of Comparative Slavery 4 QH

Slavery has had major psychological effects on the shaping of the black American experience, as well as on the experience of blacks throughout the world. An analysis of the sociological implications of slavery on group interrelations, social norms, and cultural aberrations covers several national versions of the slave system in Africa, Europe, the Caribbean, and North and South America.

AFR 1440 Racial Integration and Its Impact on Education 4 QH

This course offers an examination of the historical struggle for desegregation. This course analyzes current urban issues in racial integration and some of the projected effects of integration.

AFR 1446 The Black Elderly in America 4 QH

Surveys the demographic characteristics of black elderly Americans compared with those characteristics of white elderly. These statistics include age, sex, educational levels, income levels, occupations, sources of income, as well as the study and comparison of certain social characteristics of black and white elderly. These will include the use of their time, relationships with primary and extended family groups, and their own view of the history of their lives as black people in America. They will also give students a perspective of what they envision the future of blacks will be in the social and economic life of America. Students will be expected to devise a questionnaire, interview senior citizens, and write a paper based on this information.

AFR 1448 Religion in Black American Society 4 QH

Black life in America cannot be fully understood without a sense of the importance of religion in the community. This course looks at the impact of religion on social structures, group behaviors, moral codes, and belief patterns in black society. Topics include the church as a social organizer, the role of the black minister in the community, and the variety of black denominations in urban and rural areas.

AFR 1449 Junior/Senior Honors Program 4 QH

For details contact the Honors Office, 183 Holmes.

AFR 1451 Seminar: Creative Expression in Blues and Jazz 4 QH

Blues and jazz have been among the most far-reaching and original artistic expressions of blacks in America. The course touches on possible African sources of inspiration for the musical literature of blues and jazz; a more important focus, however, is on blues and jazz as a reflection of African-American life and on the impact these musical forms have had on black self-image and position in American culture.

AFR 1470 Black Political Thought 4 QH

How do the black people as a unit view the American political system and black people's chances of improving their lot in this country? This course examines black opinions, from the radical to the ultra-conservative, of the United States political system. The focus is historical in context and will address notions of political socialization and the development of black political ideologies.

AFR 1471 Seminar: Black Political Leadership 4 QH

Focuses on several prominent black political leaders in the twentieth century, with an examination of the factors and social contexts that contributed to or thwarted their leadership. Students will be expected to conduct research on a particular black political leader and present a critical analysis of the impact of that political leader on the black community. *Prereq.* AFR 1171 or consent of instructor.

AFR 1475 Public Policy Analysis 4 QH

Analyzes the dynamics of the public policy formation process at the local, national, and international levels, with particular attention to the implications of public policy for minority groups. Emphasis is placed on a critique of the policy maker's role and power in the socio-economic setting.

AFR 1480 Black Man/Black Woman 4 QH

Sociological and anthropological methods are used to examine black male and female personality development as well as the development of black male and female behavior, self-image, sexual roles, and behavior within both the black and the white communities.

AFR 1491 African Civilization 2 4 QH

This course on African civilization covers the period from 1800 to the present era. Emphasis will be placed on the relation between Europe and Africa, the circumstances surrounding the imperialist partition of Africa, and the decolonization process. *Prereq.* AFR 1191 or permission of instructor.

INT 1201 An Analysis of American Racism 4 QH

This seminar in contemporary aspects of racism in America discusses the cycle by which racism in our institutions helps form our attitudes and the manner in which our attitudes, in turn, shape our institutions. Emphasis is on the practical, day-to-day aspects of racism, rather than the theoretical and historical.

The following courses may be of interest to the student wishing to concentrate in African-American Studies. Descriptions for these courses may be found in the appropriate department listing.

PHL 1100 Introduction to Philosophy**PHL 1140 Social and Political Philosophy****PHL 1243 Existentialism****PHL 1335 Moral Philosophy****PHL 1303 Political Behavior****POL 1317 Law and Society****POL 1320 Political Parties and Pressure Groups****POL 1342 Crisis and Conflict in Black Africa****POL 1354 The Politics and Policies of Developing Nations****POL 1360 The Politics of Revolution and Change****POL 1362 Civil Liberties****POL 1370 Political Theory****POL 1378 Contemporary Political Thought****POL 1386 International Law****POL 1345 Urban Anthropology**

SOA 1355 Political Anthropology
 SOA 1360 Economic Anthropology
 SOA 1147 Urban Society

SOC 1170 Race and Ethnic Relations
 SOC 1310 Class, Power, and Social Change

American Sign Language

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American Sign Language courses are an integral part of two undergraduate degree programs: the human services specialization in deaf studies and the linguistics major. For more information, contact the American Sign Language Program, 276 Holmes Hall. See also human services and linguistics majors.

ASL courses do not satisfy the College of Arts and Sciences modern foreign language requirement for the BA, but they do satisfy humanities requirements of many major programs. Many students take ASL courses as free electives for personal or professional enrichment.

ASL 1101 American Sign Language 1 4 QH
 Introduces American Sign Language and deaf culture, focusing on frequently used signs, basic rules of grammar, nonmanual aspects of ASL, and some cultural features of the deaf community.

ASL 1102 American Sign Language 2 4 QH
 Continues basic language and culture study. Offers an opportunity to build receptive and expressive sign vocabulary. Topics include use of the signing space; further use of nonmanual components, including facial expression and body postures. Introduction to fingerspelling. *Prereq.* ASL 1101 or permission of instructor.

ASL 1201 Intermediate American Sign Language 1 4 QH
 Emphasizes further development of receptive and expressive skills, fingerspelling, vocabulary building, grammatical structures; encourages more creative use of expression, classifiers, body postures, and the signing space. Introduction to regional and ethnic sign variations and political and educational institutions of the deaf community. *Prereq.* ASL 1102 or permission of instructor.

ASL 1202 Intermediate American Sign Language 2 4 QH
 Offers intensive practice involving expressive and receptive skills in story telling and dialogue. Introduces language forms used in ASL poetry and to the features of culture as they are displayed in art and the theatre. *Prereq.* ASL 1201 or permission of instructor.

ASL 1211 Deaf Culture 4 QH
 Focuses on the status of deaf people as a linguistic and cultural minority group. Topics include the role of American Sign Language in the deaf community; educational and historical perspectives on deafness; and sociological and cultural make-up of the deaf community. *Prereq.* ASL 1101.

ASL 1212 Deaf History 4 QH
 Surveys the history of deaf people in the Western world, with emphasis on the American deaf community, their language, education, and relationship to hearing society.

ASL 1301 Advanced American Sign Language Proficiency 4 QH
 Emphasizes vocabulary building and mastery of fine points of grammar through rigorous receptive and expressive language activities. Includes student-led discussions, debates, and reports on topics in deaf culture, society, and current affairs. *Prereq.* ASL 1202 or permission of instructor.

ASL 1401 American Sign Language Literature 4 QH
 Various genres of American Sign Language will be read and discussed in ASL. This course will concentrate on the work of current, recognized narrators in both literary and face to face storytelling traditions, and will also include selected autobiographical sketches, lectures, stories, and letters from the early 1900s by such historical figures as Clerc, Veditz, E.M. Gallaudet, and others. A videotaped research essay in ASL will be required at the end of the course. *Prereq.* ASL 1202.

ASL 1801, ASL 1802, ASL 1803, ASL 1804, ASL 1805 Directed Studies 4 QH each
 Directed studies offer students an opportunity to go beyond course work of the regular curriculum or to pursue an individual learning project. May include research, practicum, or language development activity.

Art and Architecture

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Numbers in parentheses within course descriptions refer to core curriculum categories listed on page 2.

ART 1100 History of Art to 1400 4 QH
Provides a survey of Western art from prehistoric times to the Renaissance.

ART 1101 History of Art Since 1400 4 QH
Surveys Western art from the Renaissance to the twentieth century.

ART 1106 Introduction to Art 4 QH
Offers an introduction to the characteristics of the visual arts, including painting, sculpture, graphic arts, and architecture. Various examples of works of art are studied as an introduction to style and technique. Includes visits to museum collections and contemporary art galleries. (II)

ART 1111 Introduction to Architecture 4 QH
Introduces the history, theory, and practice of architecture. Shows how architects in different historical periods have balanced the demands of function, construction and aesthetics. Lectures concentrate on such specific designs problems as found in churches, houses, skyscrapers, and cities.

ART 1115 Art and Society 4 QH
Examines how societal forces and political ideologies are expressed in the visual arts, especially in painting and architecture. Combines a broad overview of a few significant historical periods with a more focused concentration on the past two hundred years.

ART 1124 Basic Drawing 4 QH
Focuses on basic drawing in pen and ink, pencil, charcoal, brush, and related media. Includes fundamentals of form, volume, and texture in drawing.

ART 1127 Basic Painting 4 QH
Presents an introductory studio course in the fundamental techniques of painting. Formal problems in the study of color, light, space systems, form, and composition establish the foundation for more individual creative expression. Critiques and slide lectures are used as needed.

ART 1130 Visual Studies Foundation 1 4 QH
Offers an introductory lecture/studio course clarifying basic principles, language, and concepts inherent in visual language systems. Utilizes both two- and three-dimensional media, including photography, film, video, and computer-generated imagery. Students will explore such fundamental concepts as composition, dimensional relationships, effects of color, pictorial and literal space, form, pattern, repetition, structure, figure/ground relationships, balance, and unity.

ART 1131 Visual Studies Foundation 2 4 QH
Continues ART 1130. Focuses on a more detailed, in-depth analysis of the special nature of the various visual art forms. Students will explore problems in painting, drawing, graphic design, sculpture, architectural design, photography, film, video, and computer generated imagery. *Prereq.* ART 1130 or equiv.

ART 1132 Principles of Graphics 4 QH
Examines principles of graphic forms through assigned problems, critiques, and lectures, emphasizing formal and conceptual understanding. Develops the student's visual problem-solving process, including comprehension of problem objective, working to specification, intensive investigation of alternatives, and the presentation of professionally crafted solutions.

ART 1134 Typography 4 QH
Introduces the fundamentals of typography, a key component of effective visual communication. Students will have the opportunity to become familiar with the historical roots, terminology, design styles, and production processes of typography. Studio problems will be assigned to explore the creative and expressive qualities of designing with type. *Prereq.* ART 1131.

ART 1138 Introduction to Printmaking 4 QH
Offers a hands-on course dealing with the methods and techniques of etching, drypoint, and calligraphy. Students will experiment with the processes of line etching, aquatint, soft/hard ground and paper relief prints as they develop an image. Slide presentations of prints will be shown each week.

ART 1139 Print Production 4 QH
Provides an overview of the production process for print graphics, including an introduction to offset lithography, screening, color techniques, composition, stat and process cameras, paper stocks, bindery methods, and economic factors. Emphasizes understanding how a design project is developed from concept to completion. Includes lectures, demonstrations, and studio problems. Lab fee.

ART 1150 Architectural Design 1 4 QH
Introduces fundamental design principles and their application to the built environment. Lectures, two- and three-dimensional design projects, and field trips. *Prereq.* ART 1156.

ART 1151 Architectural Design 2 4 QH
Continues ART 1150. Introduces the principles of climate, site, human factors, codes, building materials and systems, structure and economy. The creation of

three-dimensional small-scale environmental design projects offers experience in analyzing and synthesizing the elements of architecture by developing and evaluating design alternatives. Studies design processes and presentation techniques. Includes field trips, readings, lectures, and individual and group discussions. *Prereq.* ART 1150.

ART 1156 Architectural Drafting 4 QH

Introduces architectural drafting techniques, tools, materials, lettering, and dimensioning. Students will be expected to make orthographic, axiometric, one- and two-point perspective drawings.

ART 1160 Introduction to Photography 4 QH

Acquaints the beginning student with the use of the camera, the negative, and the print. Weekly shooting assignments, demonstrations, and hands-on lab experience are part of this active, primary-level course. Lab fee.

ART 1170 Filmmaking Workshop 4 QH

Introduces students to the nature and creative uses of video. Examines video's technological foundation, conventions, and aesthetic potential. Emphasizes weekly hands-on lab assignments and substantive final project. Includes lectures, screenings, and critiques. Facilities and equipment are provided by the department.

ART 1180 Video Basics 4 QH

Introduces the fundamental nature of the video medium and its creative use. Examines the technological foundation of video, the established conventions of effective field and studio production techniques and postproduction techniques (electronic editing), and explores the aesthetic potential of both the visual and auditory aspects of video. Emphasizes weekly hands-on lab assignments with a final substantive video project required of each student. Facilities and equipment are provided.

ART 1190 Introduction to Computer Graphics 4 QH

Introduces computer graphics, exploring the use of the computer as subject and tool for art making. Students will become acquainted through hands-on design projects, lectures, discussions, and demonstrations to the current and potential applications of computer graphics, and to the changing role of the artist in a technological society. Lab fee. *Prereq.* ART 1131 or equiv.

ART 1200 Ancient Architecture 4 QH

Surveys the architecture and urban form of Ancient Egypt, Mesopotamia, Greece and Rome, emphasizing the role Greece and Rome played in laying the foundation of Western architecture.

ART 1202 Armenian Art and Architecture 4 QH

Examines Armenia's castle and church architecture, sculpture, and illuminated manuscripts of the Middle Ages. Explores Armenia's ties with Rome, Byzantium, the Far East, and western Europe.

ART 1203 Medieval Architecture 4 QH

Studies the major religious and secular buildings of the Early Christian, Byzantine and Gothic periods, emphasizing Gothic architecture of France and England.

ART 1204 Renaissance Architecture 4 QH

Studies Italian painting and sculpture from the early fourteenth century to the end of the sixteenth century, with emphasis on the art of the great painters and sculptors of the Renaissance, such as Masaccio, Botticelli, Donatello, da Vinci, Michelangelo, and Titian.

ART 1205 Renaissance Art 4 QH

Surveys Italian painting and sculpture from the early fourteenth century to the end of the sixteenth century. Emphasizes the work of Masaccio, Botticelli, Donatello, da Vinci, Michelangelo, and Titian.

ART 1210 Nineteenth Century Painting 4 QH

Examines European painting and related arts including the neoclassical, romantic, realist, and impressionist movements. Emphasizes French painting, but also considers important developments in England and other western European countries.

ART 1213 Modern Art 4 QH

Traces the development of painting, sculpture, and related arts from European avant-garde in the late nineteenth century to the international market of the late twentieth century. Topics include challenges to traditional boundaries between media, the development of abstraction and the idea of pure form, and the recent emergence of a post-modern aesthetic.

ART 1217 History of Marine Painting 4 QH

Studies the image of the sea as used by various painters. Examines the work of such artists as Turner, Delacroix, Monet, Rembrandt, and many others stylistically within a historical context.

ART 1220 American Art 4 QH

Surveys the history of American painting and sculpture from the seventeenth century to the present. Focuses on the cultural forces that shape the evolution of art in America. Includes frequent museum visits.

ART 1223 American Architecture 4 QH

Introduces American architecture, town planning, and urban design from the 1700s to the 1930s. Considers European influences and uniquely American contributions.

ART 1225 Modern Architecture 1 4 QH

Surveys the development of modern architecture in England, France, Germany, and the United States from the mid-eighteenth to the late nineteenth century. Discusses architecture and urban design as a cultural response to society's changing conditions. Considers such themes as symbolism, morality, rationalism, and functionalism. *Prereq.* ART 1111 or permission of instructor.

ART 1228 Modern Architecture 2 4 QH

Examines the forms and principles of European and American architecture of the twentieth century, emphasizing the work of such key figures as Frank Lloyd Wright, Mies van der Rohe, Le Corbusier, and Louis Kahn; and such influential movements as the Dutch de Stijl, Russian constructivism, and American post-modernism.

ART 1230 History of Photography 4 QH

Explores photography from its origins in the early nineteenth century to its maturity in the mid-twentieth century. Surveys technological developments but emphasizes the emergence of photography as an expressive medium and its relation to other modern art forms.

ART 1233 Contemporary Directions in Photography 4 QH

A slide/lecture course designed to acquaint the student with trends in twentieth-century photography. Photojournalism, documentary, commercial, and creative photography will be examined closely in relation to other communication media.

ART 1235 History of Film 4 QH

Surveys major international developments in film from the late nineteenth century to the present. Examines national movements, technological and aesthetic innovations, important figures, and significant films. Includes films, lectures, and discussions.

ART 1236 American Film 4 QH

Surveys the rise of the American film from the late nineteenth century to the present. Examines key films, directors, major themes, and film forms and techniques. Includes lectures, screenings, and discussions.

ART 1237 Contemporary Directions in Cinema 4 QH

Contrasts major international film movements from World War II to the present. Examines key films, people, and themes in exploring the influences on contemporary film form and content.

ART 1238 Documentary Film 4 QH

Examines the aesthetics, tradition, and history of the documentary film, with major emphasis on contemporary directions.

ART 1240 History of Graphic Design 4 QH

Surveys graphic design from the mid-nineteenth century to the present. Focuses on the evolutionary development of graphic design, its special nature and function, major periods and trends, the historical influence of the fine arts, and contemporary directions in design evident today. Includes slide lectures and discussions.

ART 1241 Advertising Design 4 QH

Introduces conceptual and visual design problems commonly found in advertising. Students, through assigned studio projects, explore the use of layout, design, color, typography, image, the use of layout techniques and tools, and develop skills in design analysis and project development. Includes an overview of advertising design. Lab fee. *Prereq.* ART 1132 or *equiv.*

ART 1243 Graphic Design 2 4 QH

Reinforces the fundamental practices and principles of good design with a special emphasis on developing overall design concepts. Students explore the inherent problems in designing public graphic systems, exhibit graphics, corporate and institutional graph-

ics, promotional and technical literature graphics, and learn skills in effective problem-solving techniques and concept development. *Prereq.* ART 1132 and ART 1134.

ART 1245 Environmental Design 4 QH

Explores the development and application of architectural graphics to the built environment. Offers a studio workshop setting, lectures, design projects, field trips, and readings. *Prereq.* ART 1223, or ART 1228, ART 1250 and ART 1134 or *equiv.*

ART 1250 Color Theory and Practice 4 QH

Offers a project-oriented course exploring the nature and properties of color, major color theories, color harmonies, and the spatial characteristics of color. Topics include color and light, the psychology of color, color symbolism, color orchestration, and the pragmatic creative application of color in image-making generally, and design specifically.

ART 1252 Architectural Design 3 4 QH

This intermediate architectural studio course allows the student to integrate the principles of ART 1150 and ART 1151 in projects of increasing complexity. Design projects of moderate scope emphasize the coordination of program, site, structure, environmental systems, construction processes, and materials. Both urban and suburban sites will be used for a minimum of two architectural projects that offer the student architectural design problems based on actual sites, building programs, and construction regulations.

ART 1253 Architectural Design 4 4 QH

Continues ART 1252 in the architectural studio series. Requires students to apply design principles to increasingly complex architectural problems. Focuses on mixed-use programs for urban sites in the studio's architectural design project. *Prereq.* ART 1252.

ART 1254 Intermediate Drawing 4 QH

Focuses on heightening the student's understanding of spatial awareness, scale movement, and expression. Students will be asked to create unusual environmental situations for their figurative compositions. A variety of media will be used, including wash, pen and ink, watercolor, chalk, charcoal, and pencil. *Prereq.* ART 1124 or *equiv.*

ART 1256 Theory of Structures I 4 QH

Introduces the theory of materials and structures. Examines basic structural elements in masonry and wood construction. Uses historic and current building types to explore the relationship between structure, materials, construction process, and architectural space. Includes lectures, discussions, field trips, and student presentation of structural models and diagrams. *Prereq.* PHY 1222.

ART 1257 Theory of Structures 2**4 QH**

Continues ART 1256, combining the basic structural elements to develop structural systems. Explores form, stability loading, and materials in relation to the design of foundation, structural steel, reinforced concrete, timber, frame, space frame, and shell systems. *Prereq.* ART 1256 and PHY 1222.

ART 1261 Intermediate Black and White Photography**4 QH**

The second-level black and white photography studio/lab course with emphasis on combining personal aesthetic choices with refined darkroom skills. The zone system for roll film cameras, toners, fiber based papers and alternative film choices will be demonstrated and assigned. A final portfolio is required for successful completion of the course. Lab fee. *Prereq.* ART 1160 or equiv.

ART 1263 Introduction to Color Photography**4 QH**

Introduces shooting, processing, and printing color negative films. Lectures cover basic color theory in relationship to photography as well as contemporary color photographic processes. Working with color negative films, students get hands-on experience in the C-41 process for developing film and the EP-2 process for printing color negatives. Weekly assignments emphasize solving technical and aesthetic problems inherent in dealing with color negative materials. Hands-on labs allow students to produce final projects. Color chemistry and facilities are provided. Lab fee. *Prereq.* ART 1160 or equiv.

ART 1265 Color Slide Production and Printing**4 QH**

Introduces shooting, processing, and printing color slide films. Lectures include slide presentations, demonstrations of the E-6 and Cibachrome processes, and critiques of student work. Weekly assignments emphasize solving technical and aesthetic problems inherent in dealing with color slide materials. Hands-on labs allow students to produce final projects. Color printing supplies and facilities are provided for student use. Lab fee. *Prereq.* ART 1160 or equiv.

ART 1268 Photography as a Career**4 QH**

Introduces the varied career options available in the field of photography. Discusses photo lab management, editorial (collateral) photography, advertising photography, multimedia, and fine arts photography. Examines each career option within the context of lectures and visual presentations, and field trips to studios, businesses, and gallery locations. Studies the different tracks from an aesthetic as well as a marketing/business perspective.

ART 1271 Animation Workshop**4 QH**

Introduces the creative possibilities of the animated film. Weekly lab assignments and a final project acquaint students with various animation techniques and the creative advantages of each. Includes film screenings, lectures, and critiques. Equipment supplied by the department.

ART 1280 Media Graphics**4 QH**

Offers a project-oriented interdisciplinary course exploring the basic methods of producing graphic

design for the video medium and audiovisual systems. Focuses on the problems of designing graphics in motion. Includes screenings, lectures, and critiques. Facilities and equipment are provided. Lab fee. *Prereq.* ART 1131 and ART 1180 or equiv.

ART 1281 Video Project**4 QH**

Offers focused, in-depth creative work in the video medium. Involves students in developing a major video project from a category of their choice: experimental, fiction, narrative, or documentary. Includes lectures, screenings, discussions, and weekly critique of student work. *Prereq.* ART 1190.

ART 1290 Electronic Publishing Design**4 QH**

Introduces the creative potential of designing within an electronic publishing environment. Explores studio problem issues of content, quality, and aesthetics in electronic medium. Includes readings, lectures, and critiques. Lab fee. *Prereq.* ART 1132 and ART 1190 or equiv.

ART 1291 Intermediate Computer Graphics Workshop**4 QH**

Offers an interdisciplinary course that further explores the creative potential of computer graphics applications. Students work with various input and output devices and become acquainted with the artistic potential of each interface. Organized as a studio/seminar workshop. Lab fee. *Prereq.* ART 1190 or equiv.

ART 1295 Computer-Aided Design**4 QH**

Introduces CAD processes for two- and three-dimensional modeling for architectural design. Studies computer-aided design techniques that support site and program analysis concept and schematic design, and design development and construction drawing applications.

ART 1310 Seminar in Modern Architecture**4 QH**

Explores contemporary issues in architectural theory, design, and practice. Examines historical forces and contemporary criticism to define the nature of modernism and post-modernism. Focuses on such architects as Louis Kahn, IM Pei, Philip Johnson, Robert Venturi and Denise Scott-Brown, Michael Graves, and Frank Gehry. *Prereq.* ART 1228 or permission of instructor.

ART 1330 Advanced Visual Communication**4 QH**

Presents an advanced interdisciplinary studio seminar in visual and media design. In a chosen area of specialization, students explore their capabilities through the practical application of conceptual and technical skills. Lab fee. *Prereq.* Permission of instructor.

ART 1355 Environmental Systems**4 QH**

Surveys the environmental systems of power, air, water, waste, and light as integral elements of architecture. Discusses the theory and practice of these systems in architectural design. Considers historical and contemporary examples of building systems that illustrate the function, technology, and aesthetics of environmental systems. Includes field trips, lectures, and individual student research projects. *Prereq.* ART 1252.

ART 1363 Advanced Photography Seminar 4 QH

Through close interaction with the teacher, students are asked to refine their technical skills and to make meaningful decisions about their relationship to the world around them through the use of black and white and/or color photography. Portfolio preparation, alternative processes, and large format will be combined to form a base of skills with which to present the student's work to a larger photographic community. This course stresses individual direction and a qualitative approach to substantive photography. Lab fee. *Prereq.* *Permission of instructor.*

ART 1713 Modern Art: Honors 4 QH

Combines in-depth investigation of selected modern artists and movements with an overview of the

diverse meanings and functions of modern art. Involves developing and presenting individual research projects. *Prereq.* *Honors status or permission of instructor.*

**ART 1800, ART 1801, ART 1802 4 QH each
Directed Study**

Offers independent work under the direction of members of the department on a chosen topic. Limited to qualified junior and senior students majoring in art, with approval of the department.

**ART 1810, ART 1811, ART 1812 4 QH each
Junior/Senior Honors Program**

For details contact the Honors Office, 213 Lake.

Biology

For specific information about terms during which courses are offered, students should inquire at the main office of the biology department, 414 Mugar Building. This is especially the case for students wishing to carry a minor in biology, since some courses acceptable only for a minor do not appear in the quarterly Elective Course Selection booklets. Students should note that courses are presented by category and are not listed in a single numerical sequence.

Students should be aware that two (or more) courses with substantially the same content may not be counted toward quantitative graduation requirements. Some instances of overlap between biology courses are noted in the individual course descriptions below. However, in addition, certain combinations of courses (for example, BIO 1150 and BIO 1151 and BIO 1253, BIO 1254, and BIO 1255) may cover essentially the same material, and certain courses in other departments of the University may duplicate certain biology courses. If a student is not sure whether particular courses overlap, the student should seek advice from departmental advisers or the Office of the Dean.

Numbers in parentheses within course descriptions refer to core curriculum categories listed on page 2.

The following courses are primarily for students with little or no background in college science and mathematics. These courses are not open to biology majors.

BIO 1111 Environment and Man 4 QH

Offers an ecological analysis of man's interaction with other organisms. Presents the necessary foundation of biological principles. *Not open to biology majors.*

BIO 1150 Human Anatomy and Physiology 1 5 QH

Focuses on cellular and tissue structure and function, and anatomical terminology. Topics include histology, anatomy, and physiology of bones, muscles, blood, and nervous systems. Lab includes a study of human bones, cat dissection, and related histology. Lab fee. *Not open to biology majors.*

BIO 1151 Human Anatomy and Physiology 2 5 QH

Covers anatomy and physiology of the respiratory, digestive, urogenital, and circulatory systems; physiology of endocrine system; a brief exploration of the anatomy and physiology of eye and ear. Lab includes studies of muscle and nerve physiology, blood physiology and histology, and physiology of respiration. Lab fee. *Prereq.* *BIO 1150; not open to biology majors.*

BIO 1152 Integrated Human Anatomy and Physiology 1 4 QH

Introduces students to human anatomy and physiology. Focuses on cell and tissue structure and function; and anatomy and physiology of the integument, nervous system, vision and hearing, and skeletal system. Lab.

BIO 1153 Integrated Human Anatomy and Physiology 2 4 QH

Presents the structure and function of the following systems: muscular, endocrine, reproductive, vascular, and immune. Lab includes cat dissection.

BIO 1154 Integrated Human Anatomy and Physiology 3 4 QH

Presents the structure and function of the cardiovascular, respiratory, urinary, and digestive systems and the regulation of metabolism and body temperature. Lab includes cat dissection. *Not open to biology majors.*

BIO 1181 The Human Organism 4 QH

Designed for nonscience majors, introduces the structure and function of the human body. Emphasizes the principles of biological and physical science as they relate to life processes in health and disease.

Lab experiments explore the workings of the students' own biological systems rather than those of other animals. Lab fee. (II) *Not open to biology majors.*

BIO 1187 Biology of Human Reproduction 4 QH

Covers structure and function of male and female reproductive systems; factors affecting sexual development, fertility, and reproductive behavior in the human species; physiology of coitus, fertilization, pregnancy, birth, and lactation; methods of controlling fertility; and sexually transmitted diseases. (II) *Not open to biology majors.*

The following courses are primarily for students majoring in science- or health-related professions or other majors (nonbiology) with equivalent background in college science and mathematics. These courses are not open to biology majors.

BIO 1112 Ecological Principles 3 QH

Identical to BIO 1211, but without lab. *Not open to biology majors.* (II) *Prereq. Nonbiology science majors or engineering majors.*

BIO 1115 Introduction to Human Biology 4 QH

Introduces students to cell biology, genetics, and animals, such as roundworms, that cause health problems. Lab. *Not open to biology majors.*

BIO 1120 Basic Microbiology 4 QH

Microbial life, emphasizing morphological characteristics, physiological activities, and disease production. Lab. (Overlaps BIO 1320, BIO 1121, and BIO 1221.) Lab fee. *Prereq. BIO 1140, or permission of instructor; not open to biology majors.*

BIO 1121 Introductory Microbiology 3 QH

Same as BIO 1120, but without lab. *Not open to biology majors.*

BIO 1140 Basic Animal Biology I 4 QH

Covers principles of biology; universal properties and processes of living organisms as exemplified by the cell and its activities; inheritance evolution; and environmental relationships. Lab. Lab fee. (Overlaps BIO 1106.) *Not open to biology majors.*

BIO 1141 Basic Animal Biology 2 4 QH

Offers systematic, comparative study of the structure and functions of animals. Considers the diversity of animals from the standpoint of evolutionary adaptation. Lab. Lab fee. (Overlaps BIO 1107.) *Prereq. BIO 1140; not open to biology majors.*

BIO 1171 Focus on the Sea: Issues and Nature 2 QH

Explores marine conservation issues through lectures, discussion, and field trips to coastal habitats and islands. Studies the sea from ecological, economic, and literary perspectives.

BIO 1175 Introduction to Marine Biology 4 QH

Offers a broad introduction to the field emphasizing principles of oceanography and marine biology. Presents the physical, geological, and biological aspects of the ocean. Discusses the diversity of marine life and how organisms interact within different marine communities. *Not open to biology majors.*

BIO 1221 General Microbiology 3 QH

Same as BIO 1320, but without lab. Not applicable for the biology major or graduate credit. *Prereq. Permission of instructor; or CHM 1265, BIO 1260, and BIO 1261; required courses may be taken concurrently.*

BIO 1255 Human Anatomy 4 QH

Focuses on the structure and development of the human body. Lab. Lab fee. *Not open to biology majors.*

Courses primarily for biology majors or for other students with equivalent background in college science and mathematics. Freshmen intending to major in biology should take the sequence BIO 1103 to BIO 1105.

BIO 1103 Principles of Biology 1 5 QH

Introduces the basic principles of biology, offering an information base for the remainder of the biology core. Topics include scientific method, cell metabolism, growth, development, elementary genetics, nutrition, photosynthesis, and respiration. Lab. Lab fee.

BIO 1104 Principles of Biology 2 5 QH

Topics include structure and function of animals, structure and general physiology of animal cells, and evolution of adaptive diversity of animals. Lab. Lab fee. *Prereq. BIO 1103.*

BIO 1105 Principles of Biology 3 5 QH

Discusses the molecular mechanisms of microbial and plant life. Introduces the various systems of plants and their role in the biological world, illustrated with lab experiments and dissection. Lab fee. *Prereq. BIO 1103 and BIO 1104.*

BIO 1106 General Biology 4 QH

Focuses on universal properties and processes of living organisms. Topics include cellular composition and cellular control, the evolutionary process, and environmental relationships. Lab. Lab fee. (Normally not for freshman biology majors. Overlaps BIO 1140.)

BIO 1107 Animal Biology 4 QH

Offers a systematic comparative study of the structure and functions of animals. Considers the diversity of animals from the standpoint of evolutionary adaptation. Lab. Lab fee. (Normally not for freshman biology majors. Overlaps BIO 1141.) *Prereq. BIO 1106.*

BIO 1133 Plant Biology 4 QH

Introduces the structure of plant cells, structure and function of roots, stems, and leaves of flowering plants. Survey of the major groups in the plant kingdom, including their morphology, reproductive biology, and economic importance. Lab. Lab fee. *Prereq. BIO 1106 and BIO 1107 or BIO 1103 through BIO 1105.*

BIO 1211 Environmental and Population Biology 4 QH

Considers the physicochemical factors influencing and influenced by organisms. Covers interactions among individual organisms and among species;

change of species by genetic natural selection; development of communities and function of ecosystems. Lab. Lab fee. (II) *Prereq.* BIO 1107 and BIO 1133 or BIO 1103 through BIO 1105.

BIO 1253 Human Physiology 1 4 QH

Offers study of the physiology of excitable cells and tissues: nerve and muscle synapses, muscular contraction, neuromuscular reflexes, autonomic nervous system, endocrinology, sensory physiology, and higher nervous function. Lab. Lab fee. *Prereq.* BIO 1106 and BIO 1107 or BIO 1103 through BIO 1105.

BIO 1254 Human Physiology 2 4 QH

Offers study of respiration and circulation: fluids, the heart, cardiovascular regulatory mechanisms and metabolism, gastrointestinal function, renal function. Lab. Lab fee. *Prereq.* BIO 1253.

BIO 1260 Genetics and Developmental Biology 4 QH

Focuses on elaboration of the classic laws of heredity, cytogenetics, molecular basis of heredity, and selected examples of the development of form and function. Lab. Lab fee. *Prereq.* BIO 1107–BIO 1133 or BIO 1103–BIO 1105 and CHM 1264.

BIO 1261 Cell Physiology and Biochemistry 4 QH

Topics include basic chemical and physical enzyme kinetics; processes of cells related to their fine structure; oxidative and intermediary metabolism; photosynthesis, membrane phenomena; chemical and physical processes of prokaryotic and eukaryotic cells. Lab. Lab fee. *Prereq.* BIO 1107 or BIO 1103–BIO 1105 and BIO 1260, CHM 1265, and CHM 1221.

BIO 1270 Diving Research Methods 4 QH

A field-oriented course designed to introduce students to techniques in the study, ecology, and physiology of subtidal marine organisms. The course will consist of the description of underwater research methods, their appropriate applications, and their implementation during field exercises under water. Topics to be covered include diving physiology, sampling design, experimental design, statistical analysis of data, population censusing methods, underwater measurements of hydrodynamics, *in situ* respirometry, underwater telemetry, underwater photography, and the use of underwater habitats and submersibles in research. Lab fee. *Prereq.* Scuba certification.

BIO 1311 Evolution 4 QH

Focuses on evolutionary history, evidence, mechanisms, and theories. Topics of current interest in evolution are emphasized. Lab fee. *Prereq.* BIO 1107 or BIO 1103 and BIO 1260.

BIO 1312 Marine Ecology 4 QH

Studies marine habitats and organisms. Focuses on primary and secondary productivity, and community structure and dynamics. Emphasizes through field work the Pacific Northwest intertidal and shallow subtidal communities. Oregon East/West program. *Prereq.* Two years of college biology.

BIO 1320 General Microbiology 5 QH

Provides morphological, ecological, and biochemical consideration of representative groups of bacteria.

Introduces virology and microbial genetics; host-parasite relationships, including basic immunological considerations; prokaryotes of medical significance; and physical and chemical controls of microbial growth. Lab. (Overlaps BIO 1120 and BIO 1221.) Lab fee. *Prereq.* Permission of instructor; or CHM 1265, BIO 1260, or BIO 1261; required courses may be taken concurrently.

BIO 1328 The Microbial World 4 QH

Studies the position, structure, and function of microorganisms in the natural world, and their utilization by humans from the perspective of their major physiological properties. Lab. Lab fee. *Prereq.* BIO 1211 and CHM 1264.

BIO 1329 Marine and Fresh Water Microbiology 1 2 QH

Examines methodological approaches to the study of the aquatic environment. Shipboard sampling and relevant field trips augment lab studies. Lab fee. *Prereq.* BIO 1320.

BIO 1330 Marine Botany 4 QH

Explores taxonomy of the major groups of marine plants, primarily algae. Investigates ecological and reproductive strategies, economic importance, and roles in diverse marine communities. Mandatory field trips in addition to lab. Lab fee.

BIO 1341 Vertebrate Zoology 4 QH

Emphasizes the systematics, natural history, zoogeography, and behavior of all classes of vertebrates. Labs consist of study of specimens and field and museum trips. Lab fee. *Prereq.* BIO 1107 or BIO 1104 and BIO 1211.

BIO 1347 Embryology 5 QH

Topics include gametogenesis, fertilization, cleavage, gastrulation, induction, organogenesis, and metamorphosis in vertebrates. Emphasis is on frog, chick, and pig in the lab. Lab fee. *Prereq.* BIO 1107 or BIO 1105 and BIO 1260.

BIO 1348 Animal Histology 4 QH

Offers microscopic study of fundamental types of animal tissues. Lab. Lab fee. *Prereq.* BIO 1105 or BIO 1107.

BIO 1351 Comparative Vertebrate Anatomy 5 QH

Focuses on morphology and phylogeny of the vertebrates. Lab studies taxonomy of the group and specific morphology of the dogfish shark, the mud puppy, the alligator, and the cat. Lab fee. *Prereq.* BIO 1105 or BIO 1107.

BIO 1370 Marine Invertebrate Zoology 5 QH

Topics include functional morphology, systematics, ecology, and phylogenetic relationships of the major invertebrate phyla. Lab emphasizes utilization of living marine forms, with dissection of representative organisms. Lab fee. *Prereq.* BIO 1105 or BIO 1107.

BIO 1371 Biological Oceanography 4 QH

Offers labs and lectures encompassing the principles of biological oceanography. Topics include physical and chemical aspects of the ocean environment, the distribution, production, and interactions of marine

planktonic organisms, and ecosystem characteristics of specific oceanographic environments. Emphasizes participation in sampling and analysis using current instrumentation and methods. Lab fee. *Prereq.* BIO 1104, BIO 1107, or BIO 1141 or equiv.

BIO 1401 Histological Technique 3 QH
Explores general methods of tissue preparation for purposes of microscopic study. Topics include preparation of solutions and stains, the microtome and its operation, together with specific directions for fixation, clearing, hardening, embedding, section cutting, and staining tissues. Lab. Lab fee. *Prereq.* BIO 1105 or BIO 1107.

BIO 1411 Tropical Terrestrial Ecosystems 3 QH
Introduces students to the plants, animals, and ecosystems of terrestrial Jamaica. *Prereq.* Two years of college biology.

BIO 1412 Benthic Marine Ecology 4 QH
Examines the interactions among bottom-dwelling invertebrates, fish, and plants and their environment. Quantitative field methods and new developments in ecological theory will be applied to examinations of the rocky intertidal zone, soft sediment areas, salt marshes, and the rocky subtidal zone. Lab fee. *Prereq.* BIO 1211; BIO 1341 recommended.

BIO 1420 Microbial Physiology 4 QH
Focuses on structure and function of the bacterial cell, emphasizing its general properties as well as on the physical and chemical factors that influence it. Lab. Lab fee. *Prereq.* BIO 1320 or equiv.

BIO 1421 Medical Virology 4 QH
Examines fundamental characteristics of animal viruses with emphasis on pathogenesis, clinical pathology, and epidemiology of the common viral diseases, including the tumor viruses and the slow viral diseases. Lab sessions focus on methods of working with animals, eggs, and cell cultures in isolating, cultivating, and identifying viruses. Lab fee. *Prereq.* BIO 1320.

BIO 1422 Medical Virology Laboratory 0 QH
Laboratory component of BIO 1421, Medical Virology.

BIO 1427 Medical Microbiology 4 QH
Topics include host parasite interactions: virulence, toxins, natural flora, immunological responses; characteristics of the common bacterial, rickettsial, and protozoal infections in humans; epidemiology, pathology, vaccines, and chemotherapy. Lab fee. *Prereq.* BIO 1320 or equiv.

BIO 1429 Marine and Fresh Water Microbiology 2 2 QH
Focuses on characterization and differentiation of aquatic micro-organisms. Topics include microbial associations in marine, estuarine, and fresh water habitats. Morphology, physiology, and ecology are stressed. Lab fee. *Prereq.* BIO 1329.

BIO 1430 Plant Physiology 4 QH
Focuses on the physiology and biochemistry of plants as a whole and at the cellular and organ levels. Considerations of mineral and nutrition, photosynthesis, hormones, growth, and development are

included. Attendance at a weekly four-hour lab, as well as preparation of a paper based on the research literature, is required. *Prereq.* BIO 1105 or BIO 1133 and CHM 1265.

BIO 1431 Lower Plants 4 QH
Offers study of nonvascular plants (algae, fungi, lichens, mosses, and liverworts), including their morphology, ultrastructure, ecology, life cycles, reproductive strategies, and economic uses. Lab. Lab fee. *Prereq.* BIO 1105 or BIO 1133.

BIO 1432 Higher Plants 4 QH
Offers study of vascular plants (club mosses, ferns, gymnosperms, and angiosperms). Origin, ecology, development, structure, paleobotanical evidence, reproductive strategies, and economic uses. Field trips included. Lab. Lab fee. *Prereq.* BIO 1105 or BIO 1133.

BIO 1437 Structural Botany 4 QH
Focuses on comparative developmental anatomy of seed plants. Lab. Lab fee. *Prereq.* BIO 1105 or BIO 1133.

BIO 1438 Flora of New England 4 QH
Examines local vascular flora (ferns, gymnosperms, and angiosperms), with emphasis on recognition and appreciation of plant family characteristics. Presents preparation of herbarium specimens. Field trip attendance is required. Lab. Lab fee. *Prereq.* BIO 1105 or BIO 1133.

BIO 1439 Economic Botany 4 QH
Offers an in-depth study of the association of plants and men. Subjects include food, beverage, drug, fiber, and medicinal products and crops, both historically and in present-day usage. Lab includes making of several plant products (paper, dried fruit, beer, etc.) as well as tours of a brewery, wholesale grocers, ethnic markets, sugar factory, and other places as time permits. Lab fee. *Prereq.* BIO 1133, or BIO 1103–BIO 1105.

BIO 1440 Advanced Invertebrate Zoology 4 QH
A lecture, field, and lab course that concentrates on one or two phyla. Subject varies from year to year, depending upon expertise of available faculty. An individual research project is required. Lab fee. *Prereq.* Two years of college biology.

BIO 1441 Parasitology 4 QH
Focuses on symbiotic relationships of protozoans, mesozoans, flatworms, nematodes, acanthocephalans, and arthropods. Lab. Lab fee. *Prereq.* BIO 1107 or BIO 1105 and BIO 1260.

BIO 1442 Vertebrate Paleontology 4 QH
Examines evolution of the vertebrates, including humans, as revealed through the fossil record. Lab, museum, and field studies. Lab fee. *Prereq.* BIO 1107 or BIO 1105, BIO 1211, BIO 1260; or permission of instructor.

BIO 1443 Tropical Terrestrial Ecology 4 QH
Introduces students to the plants, animals, and ecosystems of terrestrial Jamaica in lectures and in the field.

BIO 1446 Ornithology 4 QH

A study of the phylogeny, anatomy, physiology, behavior, and ecology of birds. Field observation, lab preparation, and study of specimens are included. Lab includes on-campus study and field trips. Lab fee.

BIO 1447 Herpetology 4 QH

Lectures emphasize the natural history, behavior, systematics, and zoogeography of recent amphibians and reptiles. Lab consists of identification and preparation of specimens, particularly local species. Mandatory field trips. Lab fee. *Prereq.* BIO 1105 or BIO 1107, and BIO 1260.

BIO 1448 Mammalogy 5 QH

Offers study of phylogeny, anatomy, physiology, and natural history of mammals. Field collection, lab preparation, and study of specimens are included. Lab. Lab fee. *Prereq.* BIO 1104 or BIO 1107, and BIO 1211.

BIO 1449 Marine Birds and Mammals 4 QH

Focuses on the phylogeny, systematics, zoogeography, morphology, physiology, reproduction, behavior, and ecology of birds and mammals associated with the marine environment, with lab emphasis on species that occur along the New England coast. Labs include identifying, dissecting, and preparing specimens. Lab fee. *Prereq.* BIO 1211 and BIO 1104, BIO 1107, or BIO 1141.

BIO 1450 Immunology 4 QH

Provides an overview of the structure and function of genes, proteins, and cells involved in the generation of the immune response. Emphasizes molecular immunology and immunogenetics. *Prereq.* BIO 1261. *Take concurrently with BIO 1467.*

BIO 1452 Comparative Neurobiology 4 QH

Focuses on structure and function in simple invertebrate nervous systems. Topics include parallel conductance theory at endogenous and synaptic potentials, nerve networks, simple sensory and motor systems. Lab fee. *Prereq.* BIO 1261.

BIO 1453 General Physiology of Invertebrates 4 QH

Basic animal functions as manifested among the major groups of invertebrates, with comparisons to the vertebrates, especially aquatic vertebrates. The course considers the cellular and biochemical bases for the functions, their control, their adaptiveness to diverse environments, and their evolutionary implications. Topics usually include: respiration, circulation, nutrition, metabolism, excretion, salt and water balance, temperature responses, biological clocks, sensory organs, and various effector organs. Lab fee. *Prereq.* BIO 1261.

BIO 1454 Comparative Vertebrate Physiology 4 QH

Considers physiological principles in the context of the phylogenetic diversity of the vertebrates, with emphasis on adaptations of animals to aspects of their life histories and environments. Comparisons with invertebrate systems will be made when appropriate. Major themes to be considered include: energetics, temperature, circulation, respiration, skeletal muscle, and salt and water balance. Lab. Lab fee. *Prereq.* BIO 1261.

BIO 1457 Neuroethology 4 QH

A lecture, field, and lab course concentrating on the mechanisms underlying behavior of model invertebrates and lower invertebrates. The overall goal will be to develop a framework to explain behavior in terms of properties and connectivity of neuronal circuits. Topics to be covered include: the cellular biology of neurons and neuronal circuits, the organization of sensory and motor systems, and field and lab analysis of simple behaviors. Lab fee. *Prereq.* BIO 1105.

BIO 1460 Current Concepts in Cell Biology 4 QH

Examines selected topics in cellular structure and function of eukaryotes, for example, their electrical and mechanical characteristics and the underlying physical and biochemical processes. Topics will vary depending upon the instructor. Lab. Lab fee. *Prereq.* BIO 1261 and physics.

BIO 1461 General Biochemistry 1 4 QH

Surveys biochemistry, emphasizing protein structure, the nature of enzymic catalysis, bioenergetics, and the metabolism of carbohydrates, lipids, and amino acids. *Prereq.* BIO 1260 and organic chemistry.

BIO 1462 General Biochemistry Laboratory 4 QH

Introduces modern research techniques used in biochemistry and molecular biology. Topics include purification and characterization of proteins, kinetic properties of enzymes, isolation of high molecular weight DNA, recombination of DNA molecules *in vitro*, isolation of bacterial clones containing recombinant molecules, and *in vitro* mutagenesis. Covers safety and moral concerns raised by genetic engineering. Includes two hours of lecture and seven hours of lab. *Prereq.* BIO 1461.

BIO 1463 General Biochemistry 3 4 QH

Emphasizes the structure and function of organelles, mechanisms of hormonal control of metabolism, and gene regulation. *Prereq.* BIO 1461, BIO 1467.

BIO 1465 Introductory Immunology 3 QH

Covers basic consideration of the physical and chemical attributes of antigens and antibodies. Antigens of biological significance as well as *in vivo* antigen-antibody interactions are discussed. *Prereq.* BIO 1261.

BIO 1466 Immunology Laboratory 2 QH

Provides lab exercises dealing with immunization, quantitative antigen-antibody reactions, electrophoretic studies (agar, acrylamide gel, and cellulose acetate), immuno-fluorescence. Lab fee. *Prereq.* BIO 1465 taken concurrently.

BIO 1467 Molecular Biology 4 QH

Emphasizes experimental design and proof in macro-molecular chemistry and genetics. Studies current theories of the detailed molecular mechanisms for the preservation, expression, and evolutionary development of biological information. Applications to general biological and health problems will be emphasized. A two-hour period each

week will be devoted to problem solving, research "game playing," and model building. *Prereq.* BIO 1261.

BIO 1470 Coastal Biology (Oregon Coast) 4 QH

The first of a series of three courses intended to introduce the student to a wide range of coastal environments. This course includes studies of the open ocean, rocky intertidal areas, sandy beaches, and estuarine environments of the Oregon coast. Basic biological principles will be demonstrated through comparative studies.

BIO 1471 Coastal Biology (Caribbean Coast) 4 QH

The second of a series of three courses intended to introduce the student to a wide range of coastal environments. This course includes studies of the open ocean, rocky intertidal areas, sandy beaches, and estuarine environments of the Caribbean. Basic biological principles will be demonstrated through comparative studies.

BIO 1472 Coastal Biology (New England Coast) 4 QH

The third of a series of three courses intended to introduce the student to a wide range of coastal environments. This course includes studies of the open ocean, rocky intertidal areas, sandy beaches, and estuarine environments of the New England coast. Basic biological principles will be demonstrated through comparative studies.

BIO 1475 Biology and Ecology of Fish 4 QH

Examines the ecology, evolution, systematics, and behavior of fish. Uses field study, lectures, and labs. Studies specimens taken from New England waters. Lab fee. *Prereq.* Two years of college biology.

BIO 1477 The Biology of Corals 4 QH

A field, lecture, and lab course which concentrates on tropical cnidaria. The course will study the sys-

tematics, anatomy, physiology and ecology of this group of animals which assume such an important role in tropical marine ecosystems. *Prereq.* Two years of college biology.

BIO 1478 The Biology of Fish 5 QH

A field, lecture, and lab course that examines the systematics, anatomy, behavior and ecology of fish. Tropical forms are emphasized. *Prereq.* Two years of college biology.

BIO 1479 Adaptations of Aquatic Organisms 4 QH

An exploration of aquatic organisms through a study of their evolutionary responses to the aquatic habitat. The physical properties of water create physical constraints that have affected form, function, and behavior of all aquatic organisms. Density, viscosity, diffusion rates, pressure effects, and elementary fluid mechanics will be used to explain such characteristics as the body shape of larvae, hearing and sound production, suspension feeding, and buoyancy. Course includes lectures, labs, demonstrations, and individual research projects. *Prereq.* Two years of college biology.

BIO 1480 Senior Biochemistry Seminar 1 QH

Examines recent developments in various topics of biochemistry. Emphasizes student presentation and analysis.

BIO 1490 Senior Seminar 1 QH

The course examines recent developments in various topics of zoology, microbiology, physiology, botany, ecology, genetics, and cell biology. Student presentation and analysis are emphasized. Limited to qualified juniors and seniors in the BA program and required of seniors in the BS program. *Prereq.* Completion of "Biocore" BIO 1103 and BIO 1261.

Chemistry

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Office of the Dean before taking the course.

Numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 2.

Introductory Chemistry Courses

CHM 1100 Special Topics in Chemistry 4 QH

Examines fundamentals and applications of chemistry of particular interest to students in business. Discusses atomic theory, chemical bonding and reactions, states of matter and common chemicals, and foundations of organic chemistry. Makes applications to plastics and polymers, biochemistry, semiconductors, and nuclear power.

CHM 1101 General Chemistry for Health-Related Majors 1 4 QH

Examines topics in inorganic chemistry of interest to students in health-related majors. Topics include

atomic structure; energy changes in physical and chemical processes; stoichiometry; chemical bonding; gases, liquids, and solids; solutions; acids and bases. Emphasizes how such ideas are related to the chemistry of the body.

CHM 1102 General Chemistry for Health-Related Majors 2 4 QH

Introduces organic substances of biological significance and discusses the structure and reactions of proteins, carbohydrates, lipids, and nucleic acids as well as the major pathways of metabolism. *Prereq.* CHM 1101.

CHM 1110 General Chemistry Preliminaries 5 QH

Introduces general chemistry by reviewing the required computational skills, basic nomenclature, and the mole concept. *Prereq.* *Permission of the course coordinator for general chemistry for the life sciences.*

CHM 1111 General Chemistry for the Life Sciences I 5 QH

Designed for nonchemistry majors. Focuses on basic concepts and definitions: the mole concept and chemical stoichiometry, states of matter, solutions, periodicity of elements, atomic structure, and chemical bonding and reactions. Lab fee. (II)

CHM 1112 General Chemistry for the Life Sciences 2A 5 QH

For students who will not be taking further chemistry. Covers chemical equilibria; acids, bases, and buffers; introduction to the organic chemistry of compounds of biological relevance; introductory biochemistry of proteins, carbohydrates, lipids, and nucleic acids. *Prereq.* CHM 1111.

CHM 1122 General Chemistry for the Life Sciences 2B 5 QH

For nonchemistry majors who will be taking CHM 1264. Subjects covered include chemical kinetics and equilibria, acids and bases, elementary thermodynamics and kinetics, and electrolysis and electrochemistry. Lab fee. (I) *Prereq.* CHM 1111.

CHM 1130 Fundamentals of Chemistry 4 QH

Focuses on applications and principles of chemistry. Examines elementary atomic theory, physical and chemical properties of matter, chemical reactions and stoichiometry, and chemical measurements with applications in engineering technology.

CHM 1131 General Chemistry for Engineering Students I 4 QH

Primarily for engineering students. Introduces the principles of chemistry, focusing upon the states and structure of matter and chemical stoichiometry.

CHM 1132 General Chemistry for Engineering Students 2 4 QH

Primarily for engineering students. Introduces the principles of chemistry, focusing upon chemical equilibria, the nature of some common materials, and energy considerations in chemical and nuclear transformations. *Prereq.* CHM 1131.

CHM 1138 General Chemistry Laboratory 1 QH

Required for students planning to major in chemical engineering. Optional for other students taking CHM 1132. Experiments pertaining to lecture material. Lab fee.

CHM 1151 General Chemistry for Science Majors I 5 QH

For chemistry majors and selected students in other majors, such as biology, physics, and so on. Focuses on basic concepts and definitions, moles, gas laws, stoichiometry, atomic structure, periodic properties, and chemical bonding. Lab fee.

CHM 1152 General Chemistry for Science Majors 2 5 QH

Topics include solutions, chemical kinetics, chemical equilibrium, chemical thermodynamics, electro-

chemistry, chemistry of the representative elements. Lab fee. *Prereq.* CHM 1141 or CHM 1151.

CHM 1153 The Chemical Elements 5 QH

For chemistry majors and selected students in other majors. Applies the principal concepts of chemistry (thermodynamics, chemical bonding, kinetics) to a systematic survey of the characteristic behavior of the chemical elements and compounds. Lab fee. *Prereq.* CHM 1122, CHM 1132, CHM 1152, or equiv.

Advanced Chemistry Courses

CHM 1221 Analytical Chemistry 4 QH

For nonchemistry majors. Covers the principles and practice of chemical methods of analysis with an introduction to spectrophotometry, ion selective electrodes, and gas chromatography. Discusses methods and applications for the fields of biology, clinical chemistry, toxicology, and environmental investigations. Lab fee. *Prereq.* CHM 1122 or equiv.

CHM 1231 Analytical Chemistry for Majors 5 QH

For chemistry majors. Covers the principles and practice of chemical methods of analysis with an introduction to spectrophotometry, ion selective electrodes, and gas chromatography. Examines method development, equilibrium limitations in analysis, and statistical evaluation of data as well as methods and applications for the fields of biochemistry, industrial chemistry, and chemical research. Lab fee. *Prereq.* CHM 1152 or equiv.

CHM 1264 Organic Chemistry for Biology Science Majors I 5 QH

For nonchemistry majors. Covers nomenclature, preparation, properties, and reactions of common organic compounds. Lab fee. *Prereq.* CHM 1122, CHM 1152, or equiv.

CHM 1265 Organic Chemistry for Biology Science Majors 2 5 QH

Continues CHM 1264. Lab fee. *Prereq.* CHM 1264.

CHM 1268 Organic Chemistry for Pharmacy Majors I 5 QH

For pharmacy majors. Covers nomenclature, preparation, properties, and reactions of common organic compounds. Lab fee. *Prereq.* CHM 1122, CHM 1152, or equiv.

CHM 1269 Organic Chemistry for Pharmacy Majors 2 5 QH

Continues CHM 1269. Lab fee. *Prereq.* CHM 1268.

CHM 1271 Organic Chemistry for Chemistry Majors and Chemical Engineering Students I 3 QH

For chemistry majors, chemical engineering students, and selected students in other majors. Covers synthesis and properties of aliphatic and aromatic hydrocarbons and their functional derivatives, correlation between the structure of organic compounds and their physical and chemical properties, and electronic interpretation of organic reactions. *Prereq.* CHM 1153 or CHM 1132 and CHM 1138.

CHM 1272 Organic Chemistry for Chemistry Majors and Chemical Engineering Students 2 5 QH

Continues CHM 1271. Lab fee. *Prereq.* CHM 1271.

CHM 1273 Organic Chemistry for Chemistry Majors and Chemical Engineering Students 3

Continues CHM 1272. Lab fee. *Prereq.* CHM 1272.

CHM 1280 Physical Chemistry for the Life Sciences 1 4 QH

Examines physiochemical principles as they apply to biological processes. Covers thermodynamics, kinetics, equilibria, oxidation-reduction reactions, transport processes, quantum mechanics, and spectroscopy. *Prereq.* CHM 1122, CHM 1152, or equiv.

CHM 1281 Physical Chemistry for the Life Sciences 2 4 QH

Continues CHM 1280. *Prereq.* CHM 1280.

CHM 1381 Physical Chemistry 1 3 QH

Introduces chemical thermodynamics. Covers the three laws of thermodynamics and their applications to thermochemistry, material equilibrium, and reaction equilibrium. *Prereq.* CHM 1132, CHM 1152, or equiv.; MTH 1223, MTH 1243, or equiv.; PHY 1223, PHY 1233, or equiv.

CHM 1382 Physical Chemistry 2 3 QH

Continues chemical thermodynamics, kinetics, and transport processes. Covers theoretical concepts and practical applications of phase equilibria, quantitative use of phase diagrams, kinetic molecular theory and applications to transport processes, reaction kinetics, and mechanism. *Prereq.* CHM 1381.

CHM 1383 Physical Chemistry 3 3 QH

Presents the fundamental principles of quantum mechanics and their application to chemical problems. Emphasizes applications to atomic and molecular spectroscopy. *Prereq.* CHM 1382.

CHM 1394 Experimental Physical Chemistry 1 2 QH

Presents experiments that demonstrate simple yet accurate ways of measuring fundamental physical chemical phenomena. Examines treating experimental methodology and error analysis. Introduces computer-based data analysis. Emphasizes the preparation of concise and literate laboratory reports. Lab fee. *Prereq.* CHM 1381 or taken concurrently.

CHM 1395 Experimental Physical Chemistry 2 2 QH

Examines experiments based on various physical chemistry topics presented in CHM 1382. Explains and demonstrates computer interfacing of experimental apparatus. Focuses on data analysis using computer-based spread sheet and analysis programs. Emphasizes preparing concise and literate laboratory reports. Lab fee. *Prereq.* CHM 1382 or taken concurrently.

CHM 1396 Experimental Physical Chemistry 3 2 QH

Focuses on experiments in atomic and molecular spectroscopy and molecular photophysics that illustrate the principles discussed in CHM 1383. Emphasizes experimental methodology and preparing reports. Lab fee. *Prereq.* CHM 1383 or taken concurrently.

CHM 1422 Instrumental Methods of Analysis 4 QH

For chemistry majors and selected students in other majors. Covers principles, methods, and applications of electroanalytical chemistry, optical spectroscopy, and chromatography. Includes selected topics in

instrumental design and function and in nonoptical spectroscopy. *Prereq.* CHM 1392 and CHM 1231 or permission of instructor. *Prereq.* CHM 1432 concurrently for chemistry majors.

CHM 1432 Instrumental Analysis Laboratory 2 QH

For chemistry majors and selected students in other majors registered for CHM 1422. Focuses on lab experiments related to topics covered in CHM 1422. Lab fee.

CHM 1441 Inorganic Chemistry 4 QH

Topics include atomic properties of free atoms and ions; ionic bonding and the structure of the solid state; the Madelung calculation; the Born-Haber and other thermodynamic cycles; valence-bond, molecular, orbital, and crystal field theories of bonding; stereochemistry of compounds of representative elements; electron-deficient compounds; and spectral and magnetic properties of transition metal compounds. *Prereq.* CHM 1393.

CHM 1461 Identification of Organic Compounds 3 QH

Examines qualitative analysis of organic compounds and mixtures, using physical, chemical, and instrumental methods. Lab fee. *Prereq.* CHM 1265 or CHM 1273.

CHM 1521 Advanced Analytical Chemistry 1 3 QH

Examines analytical separations. Corresponds to CHM 3521. *Prereq.* CHM 1422 or equiv.

CHM 1523 Advanced Analytical Chemistry 2 3 QH

Examines the theory, practice, instrumentation, and application of selected electroanalytical methods of analysis. Corresponds to graduate course CHM 3523. *Prereq.* CHM 1422 or equiv.

CHM 1525 Advanced Analytical Chemistry 3 3 QH

Covers optical methods of analysis. Corresponds to CHM 3525. *Prereq.* CHM 1422 or equiv.

CHM 1541 Advanced Inorganic Chemistry 1 3 QH

Covers application of quantum chemistry to inorganic systems. Corresponds to graduate course CHM 3541. *Prereq.* CHM 1441.

CHM 1542 Advanced Inorganic Chemistry 2 3 QH

Continues CHM 1541. Corresponds to graduate course CHM 3542. *Prereq.* CHM 1541.

CHM 1543 Advanced Inorganic Chemistry 3 3 QH

Chemistry of the solid state. Corresponds to graduate course CHM 3543. *Prereq.* CHM 1542.

CHM 1561 Advanced Organic Chemistry 1 3 QH

Focuses on organic structure and reactions. Corresponds to graduate course CHM 3561. *Prereq.* CHM 1273 or CHM 1265.

CHM 1562 Advanced Organic Chemistry 2 3 QH

Examines organic structure and reactions. Corresponds to graduate course CHM 3562. *Prereq.* CHM 1561.

CHM 1563 Advanced Organic Chemistry 3 3 QH

Focuses on organic structure and properties. Corresponds to graduate course CHM 3563. *Prereq.* CHM 1562.

CHM 1564 Spectrophotometric Identification of Organic Compounds 3 QH

Examines spectrophotometric identification of organic compounds. Corresponds to graduate course CHM 3564. *Prereq.* CHM 1273 or equiv.

CHM 1581 Advanced Physical Chemistry 1 3 QH

Examines chemical thermodynamics. Corresponds to graduate course CHM 3581. *Prereq.* CHM 1383.

CHM 1591 Advanced Physical Chemistry 2 3 QH

Focuses on atomic and molecular structure. Corresponds to graduate course CHM 3591. *Prereq.* CHM 1383.

CHM 1594 Advanced Physical Chemistry 3 3 QH

Explores chemical kinetics. Corresponds to graduate course CHM 3594. *Prereq.* CHM 1383.

CHM 1738 General Chemistry Laboratory 1 QH

Honors equivalent of CHM 1138.

CHM 1741 General Chemistry 1 (Honors) 4 QH

Honors equivalent of CHM 1131.

CHM 1751 General Chemistry 1 (Honors) 5 QH

Honors equivalent of CHM 1101.

CHM 1752 General Chemistry 2 (Honors) 5 QH

Honors equivalent of CHM 1152.

CHM 1800, CHM 1801, CHM 1802, CHM 1803, CHM 1804, CHM 1805 4 QH each**Undergraduate Research**

Students may conduct original experimental work under the direction of a faculty member. A minimum of a two-quarter commitment and approval of the executive officer of the chemistry department are required. *Prereq.* at least middler year chemistry major status with a minimum QPA of 2.8 in courses required for the major.

CHM 1811 Advanced Chemical Laboratory Practice 1 4 QH

Staff members direct lab projects in analytical, inorganic, organic, and physical chemistry. Approval of the executive officer of the chemistry department is required. Lab fee. *Prereq.* CHM 1273, CHM 1395, CHM 1396, and CHM 1422.

CHM 1812 Advanced Chemical Laboratory Practice 2 4 QH

Students may continue lab projects from CHM 1811 or carry out new projects in different areas. Approval of the administering committee is required. Lab fee. *Prereq.* CHM 1811.

CHM 1830 Special Topics 4 QH

Prereq. CHM 1381 and CHM 1382.

CHM 1840, CHM 1841, CHM 1842, CHM 1843**Junior/Senior Honors Program**

For details contact the Honors Office, 183 Holmes.

Cinema

The following film courses are described under the different department headings. For information about the cinema studies minor, see the section on interdisciplinary minors at the beginning of the Curriculum Guide, or call the Program in Cinema Studies, 4 Boston YMCA, 617-437-5163.

Art

ART 1170 Filmmaking Workshop
 ART 1180 Video Basics
 ART 1233 Contemporary Directions in Cinema
 ART 1235 History of Film
 ART 1236 The American Film
 ART 1238 Documentary Film
 ART 1280 Media Graphics
 ART 1281 Video Project
 ART 1800 Directed Study

English

ENG 1288 Film and Text
 ENG 1289 Shakespeare on Film
 ENG 1290 Topics in Film
 ENG 1291 Popular Culture
 ENG 1294 Modern Film
 ENG 1296 American Film and Society
 ENG 1297 Approaches to Film

History

HST 1494 History and Film
 HST 1575 History of Media in America

Interdisciplinary

INT 1320 Exploring the Humanities Through Film (core course category II)
 INT 1321 Modernism

Modern Languages

LNF 1521 French Film
 LNF 1550 Introductory Film Analysis
 LNF 1551 Film Theory (core course category V)
 LNF 1560 Film and Psychoanalysis
 LNS 1550 Spanish Film Masterpieces

Music

MUS 1139 Film Music

Sociology/Anthropology

SOA 1120 Camera on Culture

Speech Communication

SPC 1450 Television 1
 SPC 1455 Television 2
 SPC 1554 Special Topics in Broadcasting (when appropriate)

Theatre and Dance

DRA 1316 Acting for the Camera (see department listing for prerequisites)

Economics

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Office of the Dean before taking the course.

Numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 2.

Unless otherwise stated, there are no prerequisites for advanced economics courses. Where prerequisites are indicated, exceptions may be granted with the instructor's permission.

ECN 1105 Principles of Macroeconomics

4 QH

Introduces students to macroeconomic analysis, which deals with the functioning of the overall economy. Topics include review of national income concepts; national income determination, fluctuation, and growth; role of the banking system and the Federal Reserve System; government expenditures and taxation; international trade; and balance of international payments.

ECN 1106 Principles of Microeconomics

4 QH

Examines the role of the market pricing system of demand and supply in determining the allocation of resources to competing uses, and why this system may not function adequately in certain cases. Study includes the application of economic principles to private and public problems.

ECN 1115 Principles of Macroeconomics

4 QH

Introduces macroeconomic analysis. Topics include the flow of national income, economic growth and fluctuation, the role of money and banking, and monetary and fiscal policies. Emphasizes the development of conceptual tools to analyze the economic problems facing modern society. (II)

ECN 1116 Principles of Microeconomics

4 QH

Focuses on development of basic theory of demand, supply, and market price. Explores applications to selected microeconomic problems, such as basic monopoly and competition, and other issues that relate to the role of the pricing system in resource allocation and income distribution. (II)

ECN 1130 Medical Economics

4 QH

Examines health-care trends in the United States and selected foreign countries, causes of the rising costs of medical care, the particular nature of the demand for health-care services, the demand for physicians and paramedical personnel, Certificate of Need committees, health maintenance organizations, medical malpractice, increases in life expectancy and its impact on society, third-party payers, and the true cost of medical education.

ECN 1140 Economics of Crime

4 QH

Covers economic analysis of crime and the criminal justice system. Topics include theoretical and empirical analysis of the economic causes of criminal behavior, the social costs of crime and its prevention, and design of enforcement policies.

ECN 1150 Economics of World Energy and Primary Resources

4 QH

Investigates economic, political, and historical backgrounds of energy and other resources problems. Analyzes future impact of primary resources limitations on United States and world economics as well as feasibility studies of resource substitution. *Prereq.* ECN 1105 or ECN 1115 and ECN 1106 or ECN 1116.

ECN 1155 Superpower Economics

4 QH

Analyzes the relative economic structures and strengths of the United States, the Soviet Union, Japan, the Common Market, and China, as well as the economic relations among these powers. Examines the impact of these relations on the domestic economies of the superpowers and of the developing nations of the world.

ECN 1170 Economic Issues In Minority Communities

4 QH

Examines the economic conditions of nonwhite minorities within the United States economy. Includes historical and cultural materials as well as specific theoretical and empirical analysis of the economic problems confronting minority communities. (VI)

ECN 1215 Macroeconomic Theory

4 QH

Investigates the conceptual and empirical problems of creating and using national accounts, price index problems, conceptual and empirical evaluation of consumption and investment functions and their policy implications, multiplier and accelerator models, and recent cyclical fluctuations. Analyzes theories of inflation, unemployment and growth in the light of recent economic history. *Prereq.* ECN 1105, ECN 1115, and MTH 1107 or equiv.

ECN 1216 Microeconomic Theory

4 QH

Examines supply-and-demand analysis, various elasticity concepts and applications, theories of demand and production, and derivation of cost curves. Analyzes pricing and output behavior in the several market structures with their welfare implications and the pricing of resources. *Prereq.* ECN 1106, ECN 1116, and MTH 1107 or equiv.

ECN 1250 Statistics I

4 QH

Discusses elementary set theory, basic probability, measurement and presentation of economic statistics, descriptive statistics, basic estimation techniques, testing statistical hypotheses, and sampling problems.

ECN 1251 Statistics 2**4 QH**

Topics include analysis of variance, correlation and linear regression analysis, multivariate regression analysis, and Bayesian decision making. *Prereq.* ECN 1250.

ECN 1310 Labor Economics**4 QH**

Focuses on economic analysis of the labor market and the labor force. Topics include the supply, development and efficient use of human resources; wage determination; the changing occupational and industrial structure; causes, nature and incidence of unemployment; the economic impact of unions, related labor market institutions and relevant public policies. *Prereq.* ECN 1106 or ECN 1116 or ECN 1105 or ECN 1115.

ECN 1311 Employment and Training Programs and Policies**4 QH**

Nature and objectives of employment and training programs, nature and causes of human resource problems, current and previous efforts to solve human resource problems in the United States, planning of human resource programs, and economic evaluation of employment and training programs. *Prereq.* ECN 1105 or ECN 1115.

ECN 1312 Women in the Labor Market**4 QH**

Focuses on economic analysis of the labor market position of women in the context of the changing economic structure and labor market institutions. Analyzes female labor force participation differences; male/female differentials in earnings and unemployment; occupational concentration, occupational segregation, theories and evidence of sex discrimination; and new opportunities for women. *Prereq.* ECN 1105 or ECN 1115 and ECN 1106 or ECN 1116.

ECN 1313 Local Labor Market Analysis and Human Resource Planning**4 QH**

Introduces methods and data sources for analyzing conditions in regional, state, and local labor markets. The primary aim is to determine the extent, nature, and causes of human resource problems and to utilize that information in planning and designing appropriate employment and training strategies. *Prereq.* ECN 1106 or ECN 1116.

ECN 1314 Economics of Education and Human Capital**4 QH**

Explores theoretical and empirical treatment of economic issues related to education and job training, including formal education (preschool through post-secondary), vocational education, on-the-job training, and government-sponsored employment and training programs. Emphasizes follow-up studies, cost-effectiveness analysis, and benefit-cost analysis for determining the effectiveness of education and training investments from a private and social standpoint. *Prereq.* ECN 1106 or ECN 1116.

ECN 1315 Income Inequalities and Discrimination**4 QH**

Focuses on economic analysis of income inequalities, poverty, and discrimination. Examines the causes of income inequality and the nature, causes and effects of poverty; economics of racial discrimi-

nation; and public welfare system and other income maintenance schemes. *Prereq.* ECN 1105 or ECN 1115 or ECN 1106 or ECN 1116.

ECN 1320 Urban Economics**4 QH**

Studies urban growth and development, intermetropolitan location of business firms, regional shifts in economic activity, intrametropolitan location of firms and households, and land use patterns. *Prereq.* ECN 1106 or ECN 1116.

ECN 1321 Urban Economic Problems and Policies**4 QH**

Focuses on economic analysis of selected urban problems such as housing, poverty, transportation, education, health, crime, and the urban environment. Discusses public policies relating to such problems. *Prereq.* ECN 1106 or ECN 1116. *Sequel to* ECN 1320. (ECN 1320 not a *prereq.*)

ECN 1322 Economics of Transportation**4 QH**

Covers transportation and land-use patterns; externalities; social costs and social benefits of various modes of transportation, ownership, regulations, and financing of various modes of transportation; and economics of new technology in transportation. *Prereq.* ECN 1106 or ECN 1116.

ECN 1330 Development Economics**4 QH**

Explores prospects for economic growth and development in poor nations as indicated by economic analysis and historical experience; social, cultural, and institutional determinants of growth; analysis of agriculture and development, the role of technological change, population; and foreign trade. (V)

ECN 1331 American Economic Development**4 QH**

Studies economic development of the United States from the colonial period to the present, historical changes in economic institutions and technologies, with special attention to preconditions of industrialism; the American Industrial Revolution, its spread and socioeconomic consequences; the Great Depression and the subsequent rise of mixed economy and welfare state; and United States adjustments to postwar economic changes.

ECN 1332 Economic History of Less Developed Countries**4 QH**

Considers the problems of initiating and sustaining economic development in selected Third World countries during the last two hundred years. Country-specific case studies cover the role of traditional economic structures, different development goals and strategies, state policies, and international economic relations. *Prereq.* ECN 1105 or ECN 1115; ECN 1106 or ECN 1116; ECN 1330 *recom.*

ECN 1333 European Economic Development**4 QH**

Discusses economic inheritance of the nineteenth-century development of capitalism and laissez-faire; the aftermath of the Industrial Revolution, European overseas expansion, the world wars, and the dissolution of empires; American economic conquest and European integration; the future of less developed areas in southern Europe; environmental impact of industrialism and the implications of technological society. (III)

ECN 1334 Comparative Economics 4 QH

Emphasizes competing types of theoretical economic systems; analysis of organization and operation of currently existing types of communist, socialist, and capitalist economies; comparison and evaluation of economic behavior and performance of different economic systems. *Prereq.* ECN 1105 or ECN 1115, and ECN 1106 or ECN 1116.

ECN 1335 International Economics 4 QH

Introduces the theory of international trade and payments, analysis of tariffs and commercial policy, the international monetary system, and trade and payment issues in developed and less-developed countries. *Prereq.* ECN 1115, ECN 1116, or *equiv.*

ECN 1337 History of Economic Thought 4 QH

Traces the evolution of Western economic thought. Covers several important schools in economics, examining the questions economists raise and analytical methods they use to study human behavior. *Prereq.* ECN 1105 or ECN 1115, and ECN 1106 or ECN 1116.

ECN 1340 Government Expenditures: Structure and Evaluation 4 QH

Covers fiscal functions of government, fiscal institutions and politics, theory of social goods, public expenditure growth and structure, federal budget expenditure evaluation and cost-benefit case studies, fiscal federalism in theory and practice, and issues of public debt and deficit. *Prereq.* ECN 1106, ECN 1116, or *equiv.*

ECN 1341 Financing of Government: Taxation and Debt 4 QH

Considers principles of taxation; problems of tax structure and reform at federal, state, and local levels; tax incidence; effects of taxation on economic efficiency and growth; negative income tax and social security finance; issues of public debt and deficit. *Prereq.* ECN 1106, ECN 1116, or *equiv.*

ECN 1342 Money and Banking 4 QH

Studies the nature and the functions of money, credit, and the role of financial organizations in the United States economy. Emphasizes theories of banking, money supply, and monetary policy. *Prereq.* ECN 1105, ECN 1115, or *equiv.*

ECN 1345 Business Cycles and Inflation 4 QH

Considers the theories of business cycles and inflation and an empirical application of these theories to current business cycle, inflation, and stagflation problems. *Prereq.* ECN 1105 or ECN 1115; ECN 1106 or ECN 1116; and ECN 1215.

ECN 1350 Introduction to Econometrics 4 QH

Presents an introduction to the methods of econometric analysis and forecasting. Covers ordinary least squares, piecewise regression, tests and corrections for serial correlation and heteroskedasticity, specification analysis, simultaneous equations systems, errors in variables, dynamic models and elementary forecasting. *Prereq.* ECN 1105 or ECN 1115; ECN 1106 or ECN 1116; and ECN 1251.

ECN 1351 Problems in Economic Research 4 QH

Examines research methods used by practicing economists. Discusses typical problems from applied areas of economics, including choice of modeling framework, problems of data collection, review of estimation techniques, interpretation of results, and development of static and dynamic adaptive policy models. *Prereq.* ECN 1105 or ECN 1115; ECN 1106 or ECN 1116; and ECN 1251.

ECN 1353 Introduction to Mathematics for Economists 4 QH

Introduces basic tools of mathematics, matrix algebra, differential and integral calculus and classical optimization, with special reference to economic applications. *Prereq.* ECN 1105 or ECN 1115; ECN 1106 or ECN 1116.

ECN 1360 Managerial Economics 4 QH

Explores the application of economic principles and theory, by the use of case studies, to the solution of decision-making problems in such areas as demand forecasting, price policies, estimation and control of costs, financing of capital investments, and responses to government taxation and regulation policies. *Prereq.* ECN 1106 or ECN 1116.

ECN 1361 Social Control of Economic Activities 4 QH

Focuses on the development of the government's role in economic activities, examining the relationships between the government and industry, labor, agriculture, public utilities, and consumers. Traces the changing role of the government from a laissez-faire policy to one of direct intervention in the economy. Covers such topics as wage and price control, environment and antipollution policies, consumer protection, and conglomerate mergers.

ECN 1362 Industrial Organization and Public Policy 4 QH

Presents an analytic framework and empirical study of how the structure of industrial organization and conduct of sellers and buyers affects economic performance and welfare. Includes industrial examples and case studies. Examines antitrust as a public policy designed to promote better market performances. *Prereq.* ECN 1106 or ECN 1116.

ECN 1401 Advanced Economic Theory 4 QH

Covers advanced theoretical treatment of selected topics in micro- and macroeconomics. Recommended for students planning to take graduate economics. *Prereq.* ECN 1215 and ECN 1216.

ECN 1481 Directed Study 1 QH

Offers independent work on a chosen topic under the direction of a faculty member of the department. Should not be substituted for the course requirements leading to a BA or BS degree in economics. Up to four quarter hours per offering, with an eight quarter-hour maximum. *Prereq.* *Qualified senior economics majors and approval of department chair.*

ECN 1482 Directed Study 2 QH

Offers independent work on a chosen topic under the direction of a faculty member of the department. Should not be substituted for the course requirements leading to a BA or BS degree in economics. Up

to four quarter hours per offering, with an eight quarter-hour maximum. *Prereq.* Qualified senior economics majors and approval of department chair.

ECN 1483 Directed Study 3 QH

Offers independent work on a chosen topic under the direction of a faculty member of the department. Should not be substituted for the course requirements leading to a BA or BS degree in economics. Up to four quarter hours per offering, with an eight quarter-hour maximum. *Prereq.* Qualified senior economics majors and approval of department chair.

ECN 1484 Directed Study 4 QH

Offers independent work on a chosen topic under the direction of a faculty member of the department. Should not be substituted for the course requirements leading to a BA or BS degree in economics. Up to four quarter hours per offering, with an eight

quarter-hour maximum. *Prereq.* Qualified senior economics majors and approval of department chair.

ECN 1492 Senior Economics Seminar 4 QH

Coordinates and applies economic concepts, methodology, and data to issues and problems of broad social, economic, and philosophical importance. *Prereq.* ECN 1216 and ECN 1215; senior economics majors only.

ECN 1495, ECN 1496, ECN 1497, ECN 1498 4 QH each
Junior/Senior Honors Program

For details contact the Honors Office, 183 Holmes.

ECN 1715 Macroeconomics Principles (Honors) 4 QH

Honors equivalent of ECN 1115.

ECN 1716 Microeconomics Principles (Honors) 4 QH

Honors equivalent of ECN 1116.

English

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Office of the Dean before taking the course.

Numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 2.

Unless otherwise indicated, the prerequisite for upperclass courses is a freshman English sequence. For students in the Basic Colleges this means ENG 1110 and ENG 1111; ENG 1013, ENG 1014, and ENG 1111; ENG 1110, ENG 1014, and ENG 1111. For the College of Engineering, ENG 1111 and ENG 1113. For School of Engineering Technology, ENG 1110, ENG 1111, and ENG 1114; ENG 1110, ENG 1014, ENG 1111, and ENG 1114; or ENG 1013, ENG 1014, ENG 1111, and ENG 1114. And for international students, ENG 1005 and ENG 1006.

ENG 1001 Intensive English as a Second Language

Reviews English grammar to help non-native speakers to develop listening, speaking, reading, writing, and studying skills. Includes language lab and small-group tutorials.

ENG 1004 Fundamentals of English for Non-Native Speakers 4 QH

Provides intensive practice in composition with accent on accurate, intelligible writing and paragraphs organized around single, well-supported ideas. Encourages sentence-combining and vocabulary development, and gives special attention to individual writing needs. Includes prose readings, class discussion, and selective review of grammar. *Prereq.* Special placement for non-native speakers whose performance or scores indicate that their writing skills are not yet up to those required for ENG 1005.

ENG 1005 English for International Students 1 4 QH

Emphasizes the development of skills needed in writing clear, expository prose essays. Requires the regular writing and rewriting of essays of increasing length and complexity. Focuses on appropriate prose readings for discussion and analysis and introduces techniques preparatory to research writing. *Prereq.* ENG 1004 or special placement.

ENG 1006 English for International Students 2 4 QH

Introduces the study of literature through close reading and discussion of fiction, nonfiction, and poetry. Advances development of rhetorical techniques by requiring frequent essays written in relation to the readings and rewritten to improve content, organization, and diction. Provides guided experience with using outside sources and library materials for writing a term paper. *Prereq.* ENG 1005 or equiv.

ENG 1013 Fundamentals of English 1 4 QH

Offers an introduction to principles of the writing process. Emphasizes individualized assistance in generating and developing ideas, drafting, revising, and organizing and mastering the conventions of written English. *Prereq.* Special placement.

ENG 1014 Fundamentals of English 2 4 QH

Continues instruction in writing, emphasizing exposition, argument, and academic essay writing, as well as the conventions of English usage, punctuation, and syntax. Individualized assistance in invention, drafting, revision, and editing. *Prereq.* ENG 1013 or ENG 1110.

ENG 1110 Freshman English 1 4 QH

Focuses on the individual student's writing skills. Includes application of important principles of composing, logic, and rhetoric to exposition and argumentation. Reviews sentence structure, punctuation, and paragraphing. Analyzes essay forms and problems. Students receiving a grade of *S* must take ENG 1014.

ENG 1111 Freshman English 2 4 QH

Continues instruction in writing, with emphasis on expository methods of defining, describing, analyzing, persuading, and composing the research paper. Students write lengthy critical essays based on consideration of primary and secondary materials. Selections of poems, stories, and plays provide an introduction to literature and are the subject matter for discussion of writing technique and written assignments. ENG 1111 follows ENG 1110 and is required of all freshmen in the University. *Prereq.* ENG 1110 or ENG 1014.

ENG 1113 Great Themes in Literature 4 QH

Explores a theme in literature through a number of illustrative works from the past and the present. Develops techniques of research and documentation.

ENG 1115 Poetry 4 QH

Involves close reading of selected poems, study of critical terms, and practice in different critical approaches to poetry; examines techniques for reading a variety of poetic texts. (II)

ENG 1116 Fiction 4 QH

Involves close reading of selected novels and short stories, study of critical terms, and practice in different critical approaches to fiction. (II)

ENG 1117 Drama 4 QH

Involves close reading of selected plays, study of critical terms, and practice in different critical approaches to drama. (II)

ENG 1118 Introduction to Language and Linguistics 4 QH

Introduces students to a new way of thinking about language. Normally, using language is as unconscious an activity as walking or chewing gum. But if we ask the right questions, we can uncover much of our unconscious linguistic knowledge: about sentence structure (syntax), meaning (semantics), word forms (morphology), and speech sounds (phonology). Understanding these will lead us to examine other issues related to language: the Black English/Standard English debate, women's and men's language, "talking" chimpanzees, "talking" computers, and the nature/nurture controversy. (II)

ENG 1119 History of the English Language 4 QH

Studies the development of modern English from Anglo-Saxon beginnings; effects of Scandinavian and Norman invasions; dialect geography; evolutionary changes, word formation, and borrowing; and origins of writing and problems of spelling. Readings include both formal and informal writings, literary selections, wills, journals, and private and public letters. (III)

ENG 1120 Survey of English Literature 1 4 QH

Surveys the major British writers and major literary forms and works from the Middle Ages to the end of the eighteenth century. Includes works by such writers as Chaucer, Spenser, Shakespeare, Milton, Pope, and Swift.

ENG 1121 Survey of English Literature 2 4 QH

Surveys the major British writers and major literary movements from the romantic period through the Victorian and modern periods to the present. Includes works by such writers as Wordsworth, Coleridge, Keats, Browning, Tennyson, Yeats, Lawrence, Lessing, and Beckett.

ENG 1123 Survey of American Literature 1 4 QH

Surveys the major American writers and major literary forms and works from the colonial period to the Civil War. Includes works by such writers as Bradstreet, Taylor, Cooper, Poe, Hawthorne, Melville, and Emerson.

ENG 1124 Survey of American Literature 2 4 QH

Surveys the major American writers and major literary forms and works from the Civil War to the mid-twentieth century. Includes works by such writers as Whitman, Dickinson, Twain, James, Hemingway, Fitzgerald, Faulkner, and Wright.

ENG 1125 Technical Writing 1 4 QH

Trains writers in the clear, unambiguous style of technical writing. Students practice these skills by writing technical proposals, process descriptions, feasibility and program reports, and operators' manuals. Includes oral presentations. Lab fee.

ENG 1126 Backgrounds in English and American Literature 4 QH

Examines translation of Greek, Roman, and biblical literature as background for literary study. Emphasizes the development of myth, genre, and theme. Readings include Homer, Virgil, Ovid, the most influential parts of the Bible, and Dante. (III)

ENG 1275 Grammar for Journalists 4 QH

Reviews the mechanics of newspaper and magazine prose. Emphasizes grammatical forms, punctuation, spelling, effective structures, and conventional usage. *Prereq.* Journalism majors only.

ENG 1276 Science Fiction 4 QH

Traces the development of various SF themes and approaches, from early man/machine love/hate relationships to alien close encounters of all kinds. From *Frankenstein* to most recent titles. Lab fee.

ENG 1277 Topics in Science Fiction 4 QH

Focuses on a single writer or group of writers (Wells or writers of contemporary American science fiction), a theme (women in science fiction or the future city), or a unifying idea (time travel or utopia/dystopia).

ENG 1278 Modern Bestseller 4 QH

Explores the function of quest, romance, and adventure in a selection of contemporary bestselling fiction.

ENG 1279 The Modern Novel 4 QH

Studies the major British and American novelists of the twentieth century. Considers theme and form in such authors as Lawrence, Woolf, Fitzgerald, Ellison, Doctorow, and Didion. (III)

ENG 1280 Modern Drama 4 QH

Studies the development of drama from realism to surrealism, from Ibsen to Beckett.

ENG 1281 The Modern Short Story 4 QH

Studies the short story from Poe to the present, including such writers as Joyce and Kafka, Hemingway and Flannery O'Connor.

ENG 1283 Contemporary Fiction 4 QH

Examines British and American writers from 1945 to the present, including such figures as Lessing, Burgess, Pynchon, and Barth. Emphasizes experimental and modernist authors.

ENG 1284 Business Tradition in Literature 4 QH

Examines the image of the business world as presented in novels and plays, biographies and autobiographies. Analyzes the cultural and historical contexts as well as the motives of the characters in society.

ENG 1285 Literature and the Law 4 QH

Investigates the problems of crime and justice as reflected in literature, from ancient to contemporary works. The secondary focus is the law itself as literature, including explorations of case files and other legal material. The readings encourage students to discover the changing nature of the criminals—heroes or victims or villains—and to deal with the social, psychological, and political facts that define them.

ENG 1286 Literature and Politics 4 QH

Students explore how authors from Sophocles to Mailer represent the religious, moral, and ethical conflicts arising from the acquisition, use, and misuse of political power. The literature falls into several categories: utopian, which establishes a conflict between the ideal and the real; satirical, which threatens a power structure by exposing it to scorn; analytic, which describes the rise to and fall from power of individuals, parties, or states; and investigative, which takes the reader inside a power elite to observe its inner operations. Participants examine the difference between the ideal of government and its reality.

ENG 1287 The Literature of Science 4 QH

Examines historically the discovery methods and models of literature and science, exploring one or more of the following areas: the relationship of the methods and models of literature and science; the treatment of scientific methods and models in literature; the use of literary devices, techniques, and traditions in scientific texts. Readings will be drawn from historically significant scientific texts, literary texts, or some combination of these. (VI)

ENG 1288 Film and Text 4 QH

Studies either the similarities and differences between literary texts and film versions of those

texts or the interrelations between film and literature as means of cultural expression during a specific historical period. For example, students might compare Doctorow's *Book of Daniel* to the film version, *Daniel*, or they might study books and movies of a period like the sixties that reflect the spirit of the era (*Catch-22*, *The Graduate*). Lab fee.

ENG 1289 Shakespeare on Film 4 QH

Examines the various treatments of Shakespeare's plays on film. Treats the technical aspects of film and how these are used by directors to transfer Shakespeare's plays from the stage to the screen. Lab fee.

ENG 1290 Topics in Film 4 QH

Studies a theme or problem (film and society, film and politics), a period in film history (American film from 1945 to the present), a film genre (the western, film noire), or a film director (Hitchcock, Coppola). Lab fee.

ENG 1291 Popular Culture 4 QH

Surveys television, film, the news media, advertising, rock music, popular magazines, romance novels, commercials, etc. Studies the social meaning of the major artifacts of contemporary culture, from TV melodrama to clothing fashions. Considers culture within the system of social distinctions that derive from class hierarchies. Analyzes the way a capitalist economic system shapes the values, ideals, and meanings that are disseminated in American popular culture.

ENG 1293 Topics in Popular Culture 4 QH

Focuses on such topics as the soap opera, the western, and the police story; on a popular culture activity; or on a popular culture perspective.

ENG 1294 Modern Film 4 QH

A selection of major modern films from around the world will be studied from a thematic, cultural, and historical perspective. Special attention is given to political, social, ethical, and psychological issues, as well as to the way common human themes emerge in quite diverse cultures. The course also covers the basic procedures of film interpretation. Lab fee.

ENG 1300 Topics in Fiction 4 QH

Studies a particular kind of fiction, such as the novella; a problem in fiction, such as the role of the narrator; a particular group of fiction writers; or a theme in fiction.

ENG 1301 Topics in Drama 4 QH

Studies a particular kind of drama, a particular group of dramatists, or a theme in drama.

ENG 1302 Topics in Poetry 4 QH

Studies a sub-genre of poetry, such as the sonnet or the dramatic monologue; a problem in poetry; a particular group of poets; or a theme in poetry.

ENG 1307 Approaches to Literature 4 QH

Examines ancient and modern theories of literature. Includes selections from the criticism of Plato, Aristotle and the Romantics, as well as from Marxist, Freudian, Jungian, and formalist theories.

ENG 1308 Myth and Archetype in Literature 4 QH
Studies twentieth-century theories of myth and archetype as they have influenced our understanding and analysis of works of literature.

ENG 1309 Topics in Literary Criticism 4 QH
Studies a specific problem method or school of criticism, such as structuralism or archetypal criticism.

ENG 1340 Writing Workshop 1 QH
Students will write one long paper, often in conjunction with an assigned paper in another course, that will be produced in a class booklet at the end of the quarter. The course emphasizes the writing process: multiple drafts, revision, editing, and publication. *Prereq. Engineering student with at least 80 QH or permission of Middler Year Writing Office, 433 Holmes, 617-437-3964.*

ENG 1350 Intermediate Writing 4 QH
Provides writing instruction in an interdisciplinary course in which students develop papers on topics relating to their majors. Led by English faculty, students will also read and respond to essays from various disciplines. Writing will be guided in stages from proposal through finished product. Lab fee.

ENG 1351 Creative Writing 4 QH
Gives the developing writer an opportunity to practice writing various forms of both poetry and prose. Features in-class discussion of student work.

ENG 1352 Advanced Writing 4 QH
Offers an opportunity for experienced writers to hone their skills and develop their interests in different forms and subjects. *Prereq. ENG 1350 or permission of instructor.*

ENG 1357 Poetry Workshop 4 QH
Advanced workshop in writing and examining original student poetry. Students experiment in established poetic forms and compose their own work. *Prereq. ENG 1351 or permission of instructor.*

ENG 1358 Fiction Workshop 4 QH
Advanced workshop in writing and examining fiction. *Prereq. ENG 1351 or permission of instructor.*

ENG 1359 Nonfiction Workshop 4 QH
Advanced workshop in writing with focus on such forms as short essays, reviews, and profiles. *Prereq. ENG 1350, ENG 1351 or permission of instructor.*

ENG 1360 Topics in Writing: Reading and Writing Nonfiction 4 QH
Combines literary analysis and creative writing. Concentrates on subjects of twentieth-century nonfiction prose such as politics, science, "culture," athletics, and natural history. Considers authors such as Elizabeth Drew, Russell Baker, and Stephen Jay Gould.

ENG 1361 The Writing Process 4 QH
Explores writing in theory and practice. Students observe writers at work and tutor students in the Writing Center as part of the course work.

ENG 1362 Publication Arts 4 QH
Acquaints students with basic publishing skills. Each student chooses an area of specialization, such as

fiction, medicine, law, or engineering, in order to develop skill in editing manuscripts.

ENG 1370 Technical Writing 2 4 QH
Offers an opportunity for students to develop technical writing skills in a particular subject or form. *Prereq. ENG 1125 or permission of instructor.*

ENG 1371 Writing for the Computer Industry 4 QH
Focuses on computer documentation, covering general information and operating and programming instructions. Includes graphics, layout, testing, and revision. *Prereq. ENG 1125 or permission of instructor and one computer science course.*

ENG 1380 Writing for the Professions: Health Services 4 QH
Provides students in the College of Nursing and the College of Pharmacy and Allied Health Professions with instruction and practice in writing lab reports, clinical evaluations, medication analyses, HEW proposals, and other professional forms.

ENG 1381 Writing for the Professions: Business Administration 4 QH
Allows students to gain professional writing experience similar to that of the workplace. Relies on the process approach to writing and features an extended simulation, which integrates common written and oral communication through practical application. Lab fee.

ENG 1382 Writing for the Professions: Criminal Justice 4 QH
Provides students in the College of Criminal Justice with instruction in writing a variety of professional forms.

ENG 1400 Topics in Genre 4 QH
Explores several genres concurrently; or studies, cross-generically, literary modes such as satire, pastoral, or melodrama; or considers a theme in a number of different genres.

ENG 1401 Introduction to Syntax 4 QH
Offers an introduction to syntax, the structural rules of a language. Develops and tests syntactic theory which, like other scientific theories, seeks to explain why things are the way they are. The question underlying the investigation is: how do the structures of language relate to the structure of the human mind? (V)

ENG 1402 Grammars of English 4 QH
Provides a study of the rules of sentence construction in English, contrasting the traditional framework with current linguistic models. Students will have the opportunity to prepose, postpose, and extrapose as they learn to manipulate grammatical constructs.

ENG 1407 Introduction to Semantics 4 QH
Focuses on meaning and how it is expressed in language — through words, sentence structure, intonation, stress patterns, and speech acts. How do content, logic, and speakers' and listeners' assumptions affect what sentences can mean? In what ways is linguistic meaning determined by our perceptual system or our culture?

ENG 1408 Topics in Linguistics**4 QH**

Examines closely one of a range of topics from the perspective of current linguistics: American dialects, language and law, women's and men's language, words and word structures, or issues in linguistics and literature.

ENG 1409 American Novels 1**4 QH**

Focuses on the themes, forms, and techniques of major American novelists of the nineteenth and early twentieth centuries, such as Cooper, Hawthorne, Melville, Twain, and James.

ENG 1410 American Novels 2**4 QH**

Studies the modern and contemporary American novel. Considers such writers as Cather, Hemingway, Fitzgerald, Faulkner, Bellow, and Baldwin. (III)

ENG 1411 English Drama 1**4 QH**

Surveys representative English drama, excluding Shakespeare, from *Everyman* to Goldsmith and Sheridan. Analyzes dramatic forms as well as the role of the Elizabethan theaters, dramatic conventions, audience content, and acting styles in Restoration farces.

ENG 1412 English Drama 2**4 QH**

Surveys representative English drama of the nineteenth and twentieth centuries. Charts the development of the genre from the nineteenth century to the present and discusses themes and forms.

ENG 1550 Psychology and the Novel**4 QH**

Concentrates on twentieth-century novels and short stories that stress individual behavior and motivation and reveal human mental and emotional processes. Includes such writers as Kafka, Dostoevski, Faulkner, Conrad, and Lawrence.

ENG 1551 Gender Roles in Literature**4 QH**

Investigates the relation between sex roles and literary portrayals. Selections represent male and female writers and provide a culturally comparative perspective.

ENG 1552 Fantasy**4 QH**

Studies the theory and practice of fantasy as found in the works of such writers as Swift, Carroll, C.S. Lewis, Orwell, and Tolkien.

ENG 1557 Topics in Fantasy**4 QH**

Explores such areas as dreams, nightmares, and borderline states of consciousness in the works of such writers as Poe and Kafka.

ENG 1558 Literature in Context**4 QH**

Attempts to place the writer in the context of a special theme. For example, students might discuss a group of authors influenced by their common interest in psychoanalysis, by their social consciousness, or by an interest in the Wild West and the settlement of America.

ENG 1559 Literature in Context**4 QH**

Similar to ENG 1558 but with different texts and contexts.

ENG 1600 Topics in Literature**4 QH**

Experiments with subjects and themes such as the censored novel, the Holocaust, alienation, and popular song lyrics.

ENG 1601 Topics in Literature**4 QH**

Same as ENG 1600 but with different topics.

ENG 1602 Major Figure**4 QH**

Examines in detail the work of one writer such as Mark Twain, Virginia Woolf, or Eugene O'Neill.

ENG 1607 Major Figure**4 QH**

Same as ENG 1602, but concentrating on the work of a different writer.

ENG 1608 The City in Literature**4 QH**

Examines the city in literature as it has been depicted from ancient times to the present, from Plato to Barthelme. Discusses such themes as the city as a locus of evil, the city as a place of possibility, and the city as a center of art and an influence on creative form in an interdisciplinary fashion.

ENG 1609 Contemporary American Literature**4 QH**

Studies major movements in American poetry and fiction since 1945. Considers such poets as Plath, Ginsberg, and Ashbery, and such novelists as Morrison, Pynchon, and Vonnegut.

ENG 1610 Early American Literature**4 QH**

Examines American literature of the colonial and federal periods, including Bradford, Taylor, Edwards, Franklin, Wheatley, Irving, and Bryant.

ENG 1611 New England Renaissance**4 QH**

Studies the development of a native tradition in the context of democratic and romantic attitudes toward experience and the paradox these attitudes reveal. Includes such writers as Emerson and Thoreau, Hawthorne, and Melville.

ENG 1612 American Realism**4 QH**

Examines the realistic tradition in American literature, including local color and native humor, from the end of the Civil War to the turn of the century. Includes such writers as Twain, James, Howells, Crane, and Norris.

ENG 1617 Modern American Literature**4 QH**

Studies major developments in American poetry and fiction from 1900 to 1945. Considers such poets as Frost, Eliot, Stevens, and Moore, and such novelists as Hemingway, Faulkner, Fitzgerald, and Porter.

ENG 1618 Children's Literature**4 QH**

Studies the history of children's literature in the English language, with special attention to matters such as genre theory and critical approaches. Includes such works as *Alice in Wonderland*, *Uncle Remus*, *Little Women*, and *The Wizard of Oz*.

ENG 1619 Topics in Children's Literature**4 QH**

Focuses closely either on a specific collection of stories (*Grimm's Fairy Tales*), on a specific genre (boys' books), on a problem of evil, or on children's literature as a form of group socialization.

ENG 1620 Major Early British Novelists 4 QH

Traces the development of the English novel from Defoe to Austen in light of new theories of narrative form, psychology, and "realism."

ENG 1621 Nineteenth-Century British Fiction 4 QH

Studies theme and form in the major English novels of the nineteenth century, considering such authors as the Brontës, Charles Dickens, George Eliot, and Thomas Hardy.

ENG 1622 Major Twentieth-Century British Novelists 4 QH

Introduces students to British fiction from Joseph Conrad to John Fowles, including such writers as D.H. Lawrence, Virginia Woolf, and others less well known. The aim of the course is to show how novels as artistic creations shape their own worlds while helping us to understand ourselves.

ENG 1627 Medieval English Literature 4 QH

Surveys the major works of medieval English literature. Includes works such as *Sir Gawain*, *Piers Plowman*, and *Pearl*.

ENG 1628 Chaucer 4 QH

Surveys the work of Chaucer, with particular emphasis on the *Canterbury Tales*.

ENG 1629 Topics in Chaucer 4 QH

Examines closely a particular work or group of works (such as *Troilus and Criseyde*) or a theme (such as Chaucer's symbolism).

ENG 1630 Milton 4 QH

Concentrates on Milton's *Paradise Lost*, with supplementary readings in his minor poetry and prose.

ENG 1631 Topics in Medieval Literature 4 QH

Focuses on such topics as a genre (romance or debate literature) or on a theme (alchemy or King Arthur).

ENG 1632 Sixteenth-Century Literature 4 QH

Concentrates on sonnets, love lyrics, and erotic narrative poetry, principally by Wyatt, Sidney, Marlowe, Spenser, and Shakespeare.

ENG 1637 Seventeenth-Century English Literature 4 QH

Examines major writers of the period, such as Bacon and Jonson, Donne and Herbert, Milton and Dryden.

ENG 1638 Topics in Seventeenth-Century English Literature 4 QH

Examines closely either a single writer or group of writers (Congreve or the metaphysical poets) or a topic (the flourishing of satire).

ENG 1639 Eighteenth-Century English Literature 4 QH

Surveys the Augustan age of comic masterpieces. Includes such major writers as Pope, Addison, Steele, Swift, Goldsmith, Burns, Johnson, and Boswell.

ENG 1640 Topics in Eighteenth-Century Literature 4 QH

Examines closely such topics as a single writer or group of writers (Fielding or the essayists), a genre (satire), or a theme (reason and madness).

ENG 1641 Romantic Poetry 4 QH

Surveys the development of English Romantic poetry, both in its lyric and longer forms, in Blake, Wordsworth, Coleridge, Byron, Shelley, and Keats. Emphasizes problems of belief and the relationship of the individual to the surrounding world of natural, social, and historical process. (V)

ENG 1642 Topics in Romantic Poetry 4 QH

Examines closely a single writer or group of writers (the Keats-Shelley circle) or a theme (poetry and revolution or the creative process).

ENG 1647 Victorian Literature 4 QH

Surveys the major issues and writers of Victorian England, considering such writers as Tennyson and Browning, Dickens and the Brontës, G.M. Hopkins and Oscar Wilde.

ENG 1648 Topics in Victorian Literature 4 QH

Examines closely a single writer or group of writers (Arnold or the fantasists) or a theme (the movement toward modernism or decadence).

ENG 1649 World Literature 1 4 QH

Surveys world literature from the time of the Greeks through the Renaissance, from Homer to Cervantes.

ENG 1650 World Literature 2 4 QH

Surveys world literature from the Renaissance through the modern period, from Voltaire to Brecht.

ENG 1651 Masterpieces of World Literature 4 QH

Studies "great books," primarily by non-English authors, that have been central to the development of Western thought and culture. Includes such writers as Homer, Dante, Montaigne, Goethe, and Proust.

ENG 1652 Twentieth-Century English Literature 4 QH

Surveys the best and most interesting work of twentieth-century British writers such as William Butler Yeats, D.H. Lawrence, W.H. Auden, Doris Lessing, and Iris Murdoch.

ENG 1657 Topics in Twentieth-Century English Literature 4 QH

Examines closely the work of a single author or group of authors (Lawrence or post-war authors) or a topic (forms of modernism or imperialism).

ENG 1658 Introduction to Shakespeare 4 QH

Covers a selection of the major plays of Shakespeare, including both tragedies and comedies. (III)

ENG 1659 Shakespeare's Comedies 4 QH

Studies the romantic comedies, problem comedies, and romances, ranging from *The Merchant of Venice* to *The Tempest*.

ENG 1660 Shakespeare's Tragedies 4 QH

Studies the nature of the tragic hero, the questioning of social norms, and the landscape of chaos, ranging from *Julius Caesar* to *Coriolanus*.

ENG 1661 Topics in Shakespeare 4 QH
Examines closely such topics as the history plays, Shakespeare in performance, the Shakespearean hero, and psychological approaches to Shakespeare.

ENG 1662 The Bible 4 QH
Studies books of both the Old Testament and the New Testament as literature and as history.

ENG 1667 Modern Poetry 4 QH
Studies the modernist tradition in American and British poetry. Considers such writers as Yeats, Hardy, Frost, Eliot, Stevens, Pound, Williams, and Cummings. (III)

ENG 1668 Topics in Modern Poetry 4 QH
Focuses on a particular theme such as the poet's use of the past, his or her role in politics, a particular problem in modern poetry, or a particular group of modern poets.

ENG 1669 Studies in English Literature 1 4 QH
A seminar on a special topic in English literature, such as color symbolism in literature or John Donne and the metaphysical poets.

ENG 1670 Studies in English Literature 2 4 QH
Same as ENG 1669 but with different topics.

ENG 1671 Studies in American Literature 1 4 QH
Studies a special topic in American literature, such as the genteel tradition or American humor.

ENG 1672 Studies in American Literature 2 4 QH
Same as ENG 1671 but with different topics.

ENG 1677 Contemporary Poetry 4 QH
Studies developments in British and American poetry since 1945. Includes such writers as Plath, Ginsberg, Lowell, Bly, Ashbery, and Heaney. (VI)

ENG 1678 Early African-American Literature 4 QH
Surveys the development and range of black American writers, emphasizing poetry and prose from early colonial times to the Civil War.

ENG 1679 Modern African-American Literature 4 QH
Surveys the development and range of black American writers, emphasizing poetry and prose from the post-Civil War period to the present.

ENG 1690, ENG 1691 Junior/Senior Seminar 4 QH
(First preference given to students needing the course to complete the major.) Explores an important aspect of literature such as the writer and the audience, the tradition of the new, style and meaning, and the jazz age. Emphasizes independent research in a seminar setting.

ENG 1710 Freshman English 1 (Honors) 4 QH
Honors equivalent of ENG 1110.

ENG 1711 Freshman English 2 (Honors) 4 QH
Honors equivalent of ENG 1111.

ENG 1713 Great Themes in Literature (Honors) 4 QH
Honors equivalent of ENG 1113.

ENG 1721 Survey of English Literature 2 (Honors) 4 QH
Honors equivalent of ENG 1121.

ENG 1723 Survey of American Literature 1 (Honors) 4 QH
Honors equivalent of ENG 1123.

ENG 1725 Technical Writing (Honors) 4 QH
Honors equivalent of ENG 1125.

ENG 1750 Intermediate Writing (Honors) 4 QH
Honors equivalent of ENG 1350.

ENG 1758 Introduction to Shakespeare (Honors) 4 QH
Honors equivalent of ENG 1658.

ENG 1781 Writing for Business (Honors) 4 QH
Honors equivalent of ENG 1381.

ENG 1810, ENG 1811 Directed Study 4 QH each

Geology

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Office of the Dean before taking the course.

Numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 2.

GEO 1119 Marine Resources 4 QH

Provides a qualitative and quantitative survey of renewable and nonrenewable resources from the sea. Aspects covered include offshore oil and gas utilization, marine minerals, tidal power, and coastal zone recreational resources, including polluted beaches and artificial fishing reefs.

GEO 1120 Physical Oceanography 4 QH

Provides a description of the physical properties and composition of sea water, waves, tides, and ocean currents. Discusses how these properties are measured by oceanographers and how they influence the earth's environment and climate.

GEO 1121 Biological Oceanography 4 QH

Topics include the productivity of animal and plant life in the various zones of the ocean and the growing economic importance of the oceans as a source of food for the expanding world population.

GEO 1122 New England Fishery Resources 4 QH

Provides an overview of the fisheries industry of New England. Emphasizes environmental factors controlling the distribution, quality, and abundance of fisheries resources. Discusses the methods and the effects of direct human utilization of the resource as well as the indirect effects of pollution and habitat modification.

GEO 1128 Geological Oceanography 4 QH

Examines the relationship between the form of the ocean basins and their margins and the major processes forming them. Emphasizes local landforms, including New England beaches, spits, barrier islands, and the continental shelf.

GEO 1140 Environmental Geology 4 QH

Discusses how geologic processes acting at the Earth's surface interact with the human environment. Topics include river and ocean flooding, coastal erosion, landslides, land-use planning, and waste disposal.

GEO 1141 Geological Hazards and Resources 4 QH

Discusses how geologic processes originating deep inside the Earth interact with the human environment. Topics include global crystal movements, volcanic and earthquake hazards, mineral resources, coal and oil, geothermal energy, resource management, and disposal of radioactive wastes. (II)

GEO 1154 Planetary Astronomy 4 QH

Focuses on astronomy of the solar system. Topics include description of the planets and other objects, with discussion of how our understanding has evolved from the days of naked-eye observation to the present era of interplanetary probes. (V)

GEO 1208 Age of Dinosaurs 4 QH

Focuses on major physical and biological events of the Mesozoic Era of earth history. Draws on evidence from the sedimentary rock record to provide a basis for interpretations of Mesozoic life, climates, mountain building, and paleogeography. Demonstrates principles of evolution and extinction through dinosaur paleobiology and history.

GEO 1210 North America and the Ice Age 4 QH

Focuses on description and history of ice sheets that have advanced and retreated across the northern United States and Canada during the last three million years. Topics include evidence of past climatic change and predictions of future change, fluctuating sea levels, and the impact of these changes on humans and the environment.

GEO 1212 Physical Geology 4 QH

Offers a systematic study of the materials comprising the Earth. Emphasizes the processes that form, transport, alter, and destroy rock, as well as the nature and development of landscape. (II)

GEO 1213 Physical Geology Laboratory 1 QH

Optional lab for GEO 1212. Exercises pertain to mineral and rock identification and topographic and geologic map interpretation. Required for geology majors. *Prereq.* GEO 1212; *may be taken concurrently.*

GEO 1222 Historical Geology 4 QH

Traces the physical and biological history of the earth through geologic time. Major topics are the origin and evolution of life, mountain building, and continental drift. (II)

GEO 1223 Historical Geology Laboratory 1 QH

Studies fossil representatives of major invertebrate phyla, application of fossils to studies of rock sequences, interpretation of geologic history from geologic maps and sedimentary rocks. *Prereq.* GEO 1222; *may be taken concurrently.*

GEO 1250 Advanced General Geology 4 QH

Offers an introduction to new and advanced concepts, theories, and hypotheses in geology through discussions, research papers, and individual projects. *Prereq.* GEO 1212 and GEO 1222.

GEO 1308 Petrology 5 QH

The hand specimen and field identification of the common igneous, sedimentary, and metamorphic rocks. Considers the modes of origin and important properties of common rock types. *Prereq.* GEO 1212.

GEO 1310 Descriptive Mineralogy 5 QH

Provides a study of mineralogy, including crystallography and physical, chemical, and descriptive mineralogy of the common rock-forming minerals. *Prereq.* Two quarters of chemistry.

GEO 1311 Optical Crystallography 5 QH

Studies the theory and practical methods of optical crystallography, including the basic techniques for determining the optical constants of crystals using the polarizing microscope and immersion media. *Prereq.* GEO 1310.

GEO 1312 Petrography 5 QH

Topics include description and identification of rocks and rock-forming minerals using thin-sections and the petrographic microscope; discussion of textural and mineralogic relationships. *Prereq.* GEO 1311.

GEO 1320 Field Geology 4 QH

Focuses on field techniques as a working guide for the approach, pursuit, and solution of geologic problems. Considers such techniques as geologic map construction, stratigraphic section measurement, and field rock description. Lab consists of field research at a quarry, roadcut, or other geologic exposure. *Prereq.* GEO 1212.

GEO 1412 Geochemistry 4 QH

Offers an evaluation of chemical processes important in the various geologic environments and their effects on the development of the lithosphere. *Prereq.* One year of chemistry.

GEO 1414 Igneous and Metamorphic Petrology 5 QH

Covers the origin and distribution of igneous and metamorphic rocks as interpreted from their chemistry, mineralogy, and field relationships. Lab includes field and petrographic analysis of rock suites. *Prereq.* GEO 1312.

GEO 1416 Economic Geology 4 QH

Focuses on the genesis, associations, and occurrence of the major ore minerals, illustrated by studies of selected ore bodies of various types throughout the world. *Prereq.* Department approval.

GEO 1418 Structural Geology 5 QH

Covers the description and origin of large- and small-scale rock structures with emphasis on interpretation of the mechanics of deformation. Field and lab analyses of structural problems using maps, models, and rock specimens. *Prereq.* GEO 1212 and GEO 1213.

GEO 1420 Geophysics 4 QH

Studies the basic techniques of reflection and refraction seismology, gravity, aeromagnetic, and heat-flow techniques and the information they provide on the structure, composition, and dynamics of the Earth's

interior. Emphasizes the application of these techniques to the search for economic minerals in the earth's crust. *Prereq.* PHY 1231.

GEO 1424 Stratigraphy 5 QH

Offers a study of paleoenvironments and sedimentary-basin analysis based on sedimentary structures, stratigraphic sequences, and fossils. Emphasizes use of geologic sections, drill-cores, and well-logs. Includes lab interpretation of sedimentary rock suites, maps, and sections. *Prereq.* GEO 1222.

GEO 1428 Invertebrate Paleontology 5 QH

Surveys major invertebrate phyla preserved in the fossil record. Discusses micro- and macro-evolutionary principles with consideration of adaptive and functional morphology and the role of paleoenvironments. Lab involves description and classification of fossil invertebrates. *Prereq.* GEO 1222.

GEO 1430 Sedimentation and Sedimentary Environments 5 QH

Describes the physical processes of sedimentation and their role in the interpretation of modern and ancient sedimentary environments. Lab concentrates on the interpretation and description of the physical and textural properties of sediments and sedimentary rocks.

GEO 1432 Sedimentary Petrology 5 QH

Topics include origin, classification, and petrography of the major groups of sedimentary rocks. Discusses the environments of deposition of the nonclastic rocks. Lab concentrates on thin-section study of sedimentary rocks. *Prereq.* GEO 1311.

GEO 1435 Coastal Processes 5 QH

Examines the effect of coastal marine processes and the resultant coastal responses. Topics include the dynamics of waves and currents and the associated erosion, transportation, and deposition of sediment, forming beaches, barrier islands, and cliffed structures. *Prereq.* GEO 1212.

GEO 1436 Marine Geology 4 QH

Compares the balance between major sedimentary and tectonic forces in ocean basins and margins to resulting ocean form. Topics include origin of continental shelves, shelf sedimentation and transport, deep-sea processes and sediments. Evaluates resource development of OCS oil, sand and gravel, and manganese nodules. *Prereq.* GEO 1212.

GEO 1438 Geology and Land-Use Planning 4 QH

Studies the causes and solutions of geologic environmental problems related to land use. Topics include the causes and prevention of land-use problems in areas of existing or potential landslides, subsidence, erosion, flooding, and groundwater pollution. *Prereq.* GEO 1140, GEO 1212, or permission of instructor.

GEO 1440 Geomorphology 4 QH

Focuses on the origin and evolution of landscape features by processes operating at or near the Earth's surface. *Prereq.* GEO 1212.

GEO 1442 Water in Environmental Planning 4 QH

Examines aspects of surface runoff from geomorphic and hydrologic perspectives. Develops methods for description and calculation of major river and drainage basin processes and applies the results to the planning process. Examines human modification of these systems, including urbanization, dams, and channelization, and applies this information to an understanding of regulatory processes. *Prereq.* GEO 1212 or permission of instructor.

GEO 1444 Glacial and Pleistocene Geology 5 QH

Covers the processes of ice movement and the characteristics and distribution of erosional and depositional structures associated with past and present glaciers; introduces Pleistocene chronology and correlations. *Prereq.* GEO 1222.

GEO 1446 Hydrogeology 4 QH

Topics include origin, distribution, and flow of groundwater in permeable sediments and bedrock; hydrological and geological characteristics of aquifers; regional flow systems emphasizing rock structure, stratigraphy, and other aspects of the geological environment; principles of hydrogeology mapping and analysis; and introduction to well design and well hydraulics. *Prereq.* GEO 1212, MTH 1107 or 1123, or permission of instructor.

GEO 1448 Groundwater Geochemistry 4 QH

Important geological processes (formation of soil, some ore deposits, caves, sinkholes) occur when groundwater interacts with rock or soil. In turn, these reactions modify groundwater chemistry and may either improve or worsen water quality. The course investigates these processes as well as groundwater contamination and dispersion, isotope tracer studies, field sampling, and analytical methods. *Prereq.* Two quarters chemistry.

GEO 1450 Geology Seminar 4 QH

Offers in-depth study, on an individual or small-group basis, of a selected geologic topic. Requires both oral and written presentations. *Prereq.* Major in geology or senior status.

GEO 1722 Historical Geology (Honors) 4 QH

Honors equivalent of GEO 1222.

GEO 1754 Planetary Astronomy (Honors) 4 QH

Honors equivalent of GEO 1154.

GEO 1816, GEO 1817 Undergraduate Research 4 QH each

Offers independent research on a selected topic under the direct supervision of a faculty member. *Open only to juniors and seniors majoring in geology, with the recommendation of the supervising faculty member and of the department.*

GEO 1820, GEO 1821 Directed Study 4 QH each

Offers independent study of a specific topic not normally contained in the regular course offerings, but within the area of competence of a faculty member. *Open to all students with the recommendation of a faculty member and departmental approval.*

GEO 1824, GEO 1825 Special Studies 1 QH each

Offers independent study of a specific topic. *Open to all students with the recommendation of a faculty member and departmental approval.*

GEO 1830, GEO 1831, GEO 1832, GEO 1833 Junior/Senior Honors Program 4 QH each

For details contact the Honors Office, 183 Holmes.

INT 1215 Into the Ocean World 4 QH

This course is a comprehensive interdisciplinary introduction to the oceans. The seas' complexity and the far-reaching consequences of our interactions with them demand an awareness of the many facets of marine study. The teaching team consists of specialists in the sciences, social sciences, humanities, and arts, each with an interest in marine issues and a commitment to bridging the gaps among disciplines. The course themes are as broad as the oceans, but when appropriate, we will focus on Boston harbor, a first step into the ocean world for those of us in this area.

INT 1217 Water Planning for the Future 4 QH

This course is an interdisciplinary introduction to our most precious resource. Water has affected our bodies, our planet, our history, and our culture. How we manage it will shape our future. Because of increasing demand, waste, and pollution, we are depleting—and risk destroying—the limited supply of usable fresh water. Students will look at water through scientific, historical, and cultural viewpoints, and survey contemporary water problems in all their dimensions—political, economic, and technological. (VI)

History

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Office of the Dean before taking the course.

Numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 2.

HST 1101 Western Civilization to 1648

4 QH

Surveys Western lifestyles, events, institutions, and culture from the earliest human societies through the end of the Thirty Years War. Focuses on Bronze Age civilizations and the origins of universalist religions, Greco-Roman civilization, early Christianity, Islam, the Germanic and Arab successor states to Rome, medieval civilization, the Renaissance and the age of exploration, the Protestant and Catholic reformations, the religious wars that ensued, and the economic transformations that occurred simultaneously. Emphasizes those elements that influenced the development of Western civilization and values. (II) *Not open to students who have completed HST 1121.*

HST 1102 Western Civilization since 1648

4 QH

Surveys the development of Western — largely European — society and values from the rise of the dynastic and bureaucratic states to current Soviet reforms and the integration of the western European economy. Covers royal absolutism, the rise of the scientific world view, the political and economic revolutions that transformed Europe at the end of the eighteenth century, the development of nationalism and Marxism, the race for colonies, the cultural transformations of the early twentieth century, World War I and the Russian Revolution, the crisis of capitalism and the rise of fascism, World War II and the Holocaust, the Cold War and decolonization, and the current state of Western civilization. (II) *Not open to students who have completed HST 1122.*

HST 1121 World Civilization to 1648

4 QH

Surveys the development of human institutions from ancient times through the crisis of the mid-seventeenth century. Emphasizes the continuities and changes that occur within civilization and the similarities, differences, and relationships that exist among contemporary civilizations around the world. Covers such topics as the rise of the world's great religions, the military and trading relationships among the various regions of the ancient and medieval worlds, the economic and technological revival of Europe in the early modern period, and the expanding struggle for resources in the crisis atmosphere of the seventeenth century. *Not open to students who have completed HST 1101 or HST 1701.*

HST 1122 World Civilization since 1648

4 QH

Examines the world from 1648 to the present. Emphasizes the intellectual, technological, and political expansion of Europe and the reactions of the rest of the world. Covers such topics as the global devel-

opment of modern dynastic and bureaucratic states; the expansion of the European economy with its attendant trade wars; imperial expansion and the explosion of the slave trade; the development and reaction of American Indian, Asian, and African civilizations to that imperialism; the sporadic extension and eclipse of colonialism; and the growing tensions between traditional patterns of loyalty and authority and national, regional, and even global systems and cultures as we approach the twenty-first century. *Not open to students who have completed HST 1102 or HST 1702.*

HST 1201 The United States to 1877

4 QH

Focuses on the history of the American people from 1763 to 1877, with an analysis of the American Revolution and the major political, constitutional, diplomatic, economic, and social problems of the new nation. (II)

HST 1202 The United States since 1877

4 QH

Continues the survey of American history, with discussion of the emergence of an industrial economy, an urban society, world responsibility, and expanded federal government. (II)

HST 1241 The Historian's Craft

4 QH

Examines the ways in which the historian studies the past and the nature of historical statements. Problems considered include research techniques, changing conceptions of historical knowledge, and the relation between the historian and the society in which he/she works. (II)

HST 1251 Social Science Methodology

4 QH

Offers an introduction to social science methodology and quantitative techniques used in historical analysis.

HST 1270 Introduction to Public History

4 QH

Explores the field of public or applied history by surveying its components, including historic preservation, oral history, historical editing, historical archeology, genealogy, family history, business history, local history, material culture, historical resource management, museology, historical research for media, archival management, management of nonprofit organizations, and policy history.

HST 1311 Ancient Greece (Group A)

4 QH

Topics include the origins and development of Greek civilization; political evolution of Hellenic society from tribal to city-state organization; and growth and application of Greek religious, political, and ethical ideas. (III)

HST 1315 Ancient Rome (Group A) 4 QH

Examines Roman civilization in two sequences: the rise of Roman power under the Republic and the decline of Roman power under the Empire.

HST 1321 Medieval Europe (Group A) 4 QH

Topics include Europe from the barbarian invasions to the late thirteenth century; the expansion of Christianity and the institutionalization of church and papacy; the emergence of the Holy Roman Empire, England, and France as political units; and social, cultural, and economic developments. (III)

HST 1331 Renaissance Civilization (Group A) 4 QH

Focuses on Europe from 1300 to 1500, when alternatives to medieval institutions became increasingly apparent. Gives special attention to political, economic, and cultural changes in Italy and northern Europe. (III)

HST 1336 Luther and His Age (Group A) 4 QH

Offers a study of Martin Luther, John Calvin, Henry VIII, Elizabeth I, and their political and religious contemporaries who between 1500 and 1650 overthrew the church's monopoly of religion, forged new relationships between princes and subjects, found new ways to create wealth, challenged the traditional roles of men and women in families and communities, and created new attitudes toward national and international politics.

HST 1351 England to 1688 (Group A) 4 QH

Studies prehistoric Britain, the Anglo-Saxons, the Normans, the Plantagenets, the Tudors, and the Stuarts, with emphasis on the development of parliamentary institutions until the Glorious Revolution.

HST 1355 Tudor England (Group A) 4 QH

Provides a study of England from the late fifteenth to the early seventeenth century. Topics include an examination of the Tudor contribution to the development of political and social institutions; the Protestant Reformation and the relation between religion and politics; social and economic changes and their relation to the Elizabethan Renaissance. Particular emphasis is placed on intellectual and cultural developments and England's relation to Europe and the New World.

HST 1358 Stuart England (Group A) 4 QH

Studies seventeenth-century England, from the reign of James I. Topics include the social, economic, and political backgrounds of the English Civil Wars or Puritan Revolution; the age of Cromwell; the restoration of the Stuarts; the Glorious Revolution; and the end of the Stuart dynasty. Uses

seventeenth-century sources and literature in addition to modern texts.

HST 1390 Population in European History (Group A or B) 4 QH

This course is based on the field of population studies and is concerned primarily with examining the causes and consequences of changes in human birth, death, marriage, and migration rates from the Old Stone Age to the late twentieth century. The interaction and impact of climate change, epidemic disease, war, economic development, and political policy, as well as changes in the structure and function of human family and child-rearing systems will be examined. (III)

HST 1392 Women in Preindustrial Europe (Group A or B) 4 QH

Examines changing sex roles from the early Christian era through the eighteenth century and assesses their significance within the social and political context of pre-industrial Europe. Topics include society's attitudes toward the sexes, family structure and marriage patterns, and male and female roles in economic life and in religious and political movements.

HST 1393 History of Science and Technology (Group A or B) 4 QH

Offers an interdisciplinary survey of the development of science and technology, integrating theories of the philosophy and sociology of science within a historical framework. Emphasizes the environmental and ideological conditions that contribute to the birth and growth of the various sciences and to the relation between these conditions and technological innovation.

HST 1395 History of Flight and Space Travel (Group A, B, or C) 4 QH

Beginning with the dreams of flight of the ancient Greeks and Leonardo da Vinci, the course traces the history of nonpowered flight from the balloon experiments of the Montgolfier brothers to contemporary hang gliders; powered flight from the Wright brothers to the SST; and rocketry and space travel from its earliest beginnings to "Enterprise."

HST 1397 Health and Sickness: Historical Perspectives (Group A, B, C, or D) 4 QH

Surveys medical theories and the health care systems derived from them, from ancient times to the present. Medical theory and practice as related both to the general history of the time and to the particular political, economic, or social circumstances that influenced institutions for health care.

HST 1407 Europe, 1870–1921 (Group B) 4 QH

Focuses on Europe from the Franco-Prussian War to the post-World War I settlement: the growing tensions and rivalries and the declining certainties of the end of the nineteenth century, the origins of World War I, the war itself, the Russian Revolution, and the Peace of Paris.

HST 1408 Europe since 1921 (Group B) 4 QH

Focuses on Europe from the Versailles Settlement: the rise of totalitarianism, the Depression, the crises of liberalism and of the European mind, the Appeasement Era, World War II, the Cold War, the end of colonialism, and Europe today.

HST 1421 England since 1688 (Group B) 4 QH

Focuses on England from the Glorious Revolution to the present, with emphasis on the development of Parliament, the Industrial Revolution, nineteenth-century reaction and reform, the world wars, and the rise of socialism.

HST 1424 Victorian England (Group B) 4 QH

Discusses the economic, social, and political life of the English people during Victoria's reign. (IV)

HST 1425 The Decline of Great Britain (Group B) 4 QH

Discusses the economic, social, and political life of the English people in the twentieth century. (IV)

HST 1428 Irish Civilization (Group B) 4 QH

Examines the history of Irish civilization from the earliest hero sagas and their impact on Irish values to the Irish independence movement, the prototype for many other twentieth-century liberation movements. (IV)

HST 1429 Introduction to Irish Studies (Group B) 4 QH

Presents Irish studies in one-week sequences from the perspective of a number of fields: art, business, drama, history, literature, music, politics, and sociology. Introduces students to the important forces that have helped to shape contemporary Ireland and Irish-American culture. Same as INT 1252. (IV)

HST 1433 The French Revolution and Napoleon (Group B) 4 QH

Examines the history of France in the age of the *ancien regime* and the Enlightenment as background for the French Revolution and Napoleon.

HST 1434 Modern France (Group B) 4 QH

Surveys the chief political, social, economic, intellectual, and cultural developments of France from the Revolution to the present. (IV)

HST 1435 History of Modern Italy (Group B) 4 QH

Offers a survey of the social, economic, and political development of the modern Italian state from the

seventeenth century to the present. Emphasizes the problem of modernization.

HST 1441 Hitler's Germany (Group B) 4 QH

Offers a study of the origins and nature of Hitler's Third Reich, emphasizing the personal lives of Nazi leaders in an attempt to understand how seemingly ordinary people could enthusiastically promote wars of aggression and revel in genocidal policies.

HST 1451 Imperial Russia (Group B) 4 QH

Focuses on the emergence of Russia as a recognized European power, westernization and expansion in the eighteenth century, the impact of Napoleon, and reform and revolution.

HST 1452 Soviet Russia (Group B) 4 QH

Examines forces molding the history of Russia since 1917, including both internal developments and foreign relations. (IV)

HST 1471 Class, Love, and Power in Western Europe (Group B) 4 QH

Provides an examination of social change in Europe since 1800 with emphasis on the interaction of industrialization, class movements, demographic trends, and revolutionary upheavals.

HST 1472 The Family in European History (Group B) 4 QH

Examines issues in the history of the European family from the late Middle Ages to the present. Topics include marriage and sexuality, child-rearing practices, the effect of industrialization and revolution on family life, the Victorian family, and the evolution of the modern family. Students will prepare their own family histories.

HST 1473 Women in Modern Europe (Group B) 4 QH

Examines the situation of women in Western Europe from the French Revolution to the 1950s, focusing on France, Britain, and Germany. Topics explored include women in revolutionary movements, the impact of industrialization on women and the family, women in the labor movements, the struggle for suffrage, and the effects of world wars on women.

HST 1481 The Culture of Europe (Group B) 4 QH

Provides an analysis of the culture of the West in the nineteenth and twentieth centuries, focusing on the conjunction of social, cultural, and psychological forces that encouraged or retarded creativity. Considers the interconnections among the arts, social sciences, and sciences within each of the periods covered. (III)

HST 1485 Communism and Revolution (Group B) 4 QH

Focuses on the history of socialism and revolution from the early nineteenth-century utopias to the New Left of the 1960s.

HST 1490 Introduction to Women's Studies: Image, Myth, and Reality (Group B or C) 4 QH

Introduces the issues and methodology involved in the interdisciplinary study of women. Encompasses the historical, political, economic, and social processes that have created both the image and the reality of women in society. Uses guest lecturers to provide an overview of the many disciplinary approaches to the study of women. This course is required for women's studies minors and can be used as a general elective or, depending on the discipline of the coordinator, to satisfy specific concentration requirements. Same as INT 1150. (II)

HST 1491 Modern Western Economic History (Group B or C) 4 QH

Surveys the development of the Western world within the framework of economic theory, with attention to social and political ramifications. (III)

HST 1493 Work and Leisure (Group B or C) 4 QH

How we work and how we play are important determinants of how we live. This course examines the historical evolution of contemporary patterns of work and leisure across cultural, sexual, and class lines. Subjects include the impact of machine technology on the worker and the workplace, workers' organizing in unions and professional groups, changing concepts of the use of time, women's work and women's leisure; recreation and sports (both participant and spectator); and the rise of the cafe and the saloon as sociable institutions. (III)

HST 1494 History and Film (Group B or C) 4 QH

Explores various historical issues as seen through the eyes of historians and filmmakers. Presents both acted and documentary films in combination with readings from a variety of source and interpretive materials.

HST 1495 Technological Transformations of Society (Groups B, C, or D) 4 QH

Examines the relation between technological innovations and the world in which they take place. Discusses conditions necessary for discovery and innovation and the impact of technology on political, economic, and social environments.

HST 1496 War in the Twentieth Century (Group B, C, or D) 4 QH

Provides an analysis of the causes, prosecutions, and effects of the major wars fought in the twentieth century, concentrating on the First and Second World Wars and on the Vietnam War. Using film, simulations, and other materials, classes explore the economic, social, cultural, and psychological impacts of these wars as well as their political, diplomatic, and material aspects.

HST 1497 The World since 1945 (Group B, C, or D) 4 QH

Offers a thematic study of issues and movements that have influenced the world's history since the end of

the Second World War. Subjects include the Cold War, the end of colonialism, urbanization, technology and ecology, cultures and counter-cultures, the "global village," and the prospects for human liberation.

HST 1501 Topics in American History (Group C) 4 QH

Covers special topics in the history of the people of the United States from 1789 to the present.

HST 1510 Colonial America (Group C) 4 QH

Covers the discovery and exploration of the New World, the settlement of the English colonies on the North American mainland, their development to 1763, and the origin of their clash with England. (III)

HST 1511 The American Revolution (Group C) 4 QH

Focuses on the coming of the American Revolution, its nature and progress, and its political, economic, and social aftermath.

HST 1514 The Civil War and Reconstruction (Group C) 4 QH

Focuses on the Civil War, its coming, its nature and progress, and the aftermath of Reconstruction.

HST 1516 The United States, 1898–1939 (Group C) 4 QH

Examines social, economic, political, and diplomatic changes from the Progressive Era through the Great Depression and the New Deal.

HST 1517 The United States, 1939–1960 (Group C) 4 QH

Examines social, economic, political, and diplomatic changes from the start of World War II to the election of John F. Kennedy.

HST 1518 The United States since 1960 (Group C) 4 QH

Examines social, economic, political, and diplomatic changes in the United States since 1960.

HST 1525 African-American History (Group C) 4 QH

Provides an in-depth examination of the major topics that have shaped the African-American experience. Topics included are slavery and its effects, the role of the antebellum free black, the Civil War and Reconstruction, black response to the new racism of the late nineteenth century, the W.E.B. DuBois–Booker T. Washington controversy, Marcus Garvey and the shaping of twentieth-century black nationalism, and the changing nature of the black revolution from Martin Luther King, Jr., to Malcolm X and beyond. Same as AFR 1131. (III)

HST 1526 African-American History since 1900 (Group C) 4 QH

Examines the rising tide of African-American nationalism during the twentieth century, with special emphasis on the founding of the NAACP, the Garvey movement, the Harlem Renaissance, the founding of the Black Muslims, A. Philip Randolph's March on Washington movement, the rise of Martin Luther King, Jr., and the demand for change epitomized by the concept of Black Power. Same as AFR 1132.

HST 1533 History of Boston (Group C) 4 QH

Explores the history of Boston from colonial times to the present, with attention to the topographical growth and the ethnic composition of the city.

HST 1539 American Jewish History (Group C) 4 QH

Examines Jewish political, social, and cultural history from the arrival of the first group of Jews at New Amsterdam in 1654 to the present. Themes covered include immigration, assimilation, family life, religion, anti-Semitism, Zionism, the Holocaust, and American-Israeli relations.

HST 1543 American Urban History (Group C) 4 QH

Examines the development of urban society in the United States in the nineteenth and twentieth centuries, with emphasis on the effects of immigration and industrialization upon the politics, thought, and society of American cities.

HST 1544 Environmental History of the United States (Group C) 4 QH

Examines American attitudes and practices toward natural and artificial environments from the first exploration to the present, paying special attention to literature, art, and landscape design.

HST 1552 American Reformers and Reform Movements (Group C) 4 QH

Provides an analysis of American reform, especially in the nineteenth century.

HST 1553 The Family in American History (Group C) 4 QH

Explores the history of the family, including the African-American family, in pre-modern and modern American society. Focuses on the traditional and modern roles of parents and children. Investigates patterns of sexuality, marriage, childrearing, work, play, death, and dying. Compares various family types, including elites, middle class, and indigent. Evaluates external forces affecting family structure and life, such as geographical mobility, industrialization, and warfare.

HST 1554 Women in America (Group C) 4 QH

Offers an analysis of women's economic and social roles from the colonial period to the present, with special attention to women's work, their roles in family and community, and nineteenth- and twentieth-century women's rights movements. (III)

HST 1555 American Elites (Group C) 4 QH

Examines the life of elite individuals and groups in American society, especially in the nineteenth and twentieth centuries.

HST 1563 History of Sport in America (Group C) 4 QH

Provides a history of the major sports and their impact on American life.

HST 1571 American Business History (Group C) 4 QH

Examines the rise of business in America, the role of the corporation, horizontal and vertical combinations, business and labor, and business and government.

HST 1575 History of Media in America (Group C) 4 QH

Focuses on mass communication in American history, with attention to the role of books, newspapers, magazines, films, radio, and television.

HST 1577 America and the Sea (Group C) 4 QH

Topics include the history of exploration and discovery of America, the development of fishing, the rise of ocean commerce, and the history of the American Navy.

HST 1578 The Automobile in America (Group C) 4 QH

Focuses on the impact of the automobile on American society in a historical context. Topics include the abandonment of traditional prohibitions of motorized carriages; the use of planning, taxes, and highway policies to foster the use of the automobile; the effect of the car on land use, recreation, and the economy; and contemporary issues such as pollution and energy.

HST 1581 The Growth of American Government to 1935 (Group C) 4 QH

Examines the expansion of government from the late nineteenth century to the Great Depression of the 1930s, focusing on the growth of the federal government, the presidency from Cleveland to Roosevelt, and new public policies.

HST 1582 The Growth of American Government Since 1935 (Group C) 4 QH

Examines the expansion of government from Roosevelt to the present, focusing on the reasons for the growth and its consequences, the development of major public policies, and the transformation of the federal role and politics.

HST 1585 American Diplomatic History (Group C) 4 QH

Focuses on the formation and administration of American foreign policy from the Revolution to the present.

HST 1586 American Military History (Group C) 4 QH

Surveys the complex relationship between American society and war, from the age of muskets to the neutron bomb.

HST 1591 China and the United States (Group C or D) 4 QH

Examines the relations between China and the United States, including the period of the missionaries and opium traders; the era of special privileges; the Open Door policy; the first half of the twentieth century, when China became America's favorite protégé; and the years of strain, warfare, and finally accommodation after the Chinese communists came to power in 1949.

HST 1592 History of the Vietnam War (Group C or D) 4 QH

Presents a history of military conflict in Vietnam with attention to the rise of the Viet Minh during World War II, the struggle against the French in the first Indochina war, the impact of the Cold War, and the involvement of the United States after 1950 in Laos and Cambodia as well as Vietnam. Emphasizes the roles of communism and nationalism in Indochina and the motives for American intervention. Films revealing American reaction to the escalating conflict will be shown.

HST 1604 Modern Latin America (Group D) 4 QH

Surveys Latin America from the mid-nineteenth century to the present. Topics include dictatorial republics and the continuation of poverty and injustice, the struggles toward democracy, the rise of nationalism, the threat of communism, and the relations between the United States and Latin America.

HST 1605 The Modern Caribbean (Group D) 4 QH

Topics include the successful Haitian revolt against slavery, peasant movements after the abolition of slavery, the Marcus Garvey movement, Caribbean music and art, the Cuban revolution, Black Power, and American interventions in the Caribbean from the Spanish-American War to Grenada. This course is the same as AFR 1297.

HST 1612 The Modern Middle East (Group D) 4 QH

Focuses on the Middle East since 1800, with emphasis on the background of present problems. (VI)

HST 1613 Contemporary Middle East (Group D) 4 QH

Focuses on political, economic, and social developments in the Middle East since World War II.

HST 1614 The Middle East Today in Fact, Fiction, and Film (Group D) 4 QH

Presents a study of social, economic, and political changes and conflict in the lives of ordinary people who have been experiencing the recent crises reported in the media. Focuses on common experiences among various peoples—Turks, Armenians, Israelis, Arabs, and Iranians—and emphasizes significant themes: lifestyles, generational conflict, the changing role of women, ethnic or ideological conflict, and the prevalence of identity crises attending cultural and social disruption.

HST 1620 Early African Civilization (Group D) 4 QH

Studies the ancient empires of Africa, especially Chana, Songhai, Mali, Zimbabwe, the city-states of East Africa, and the Congo Kingdom. Includes Ethiopian and Egyptian history and controversies to 1800. Same as AFR 1191.

HST 1621 Modern African Civilization (Group D) 4 QH

Provides an introduction to modern Africa in the years from 1800 to 1960, showing how a new African civilization arose out of the conflict-ridden conditions imposed on the old. Themes include economic, social, political, religious, and artistic life, as well as the influences of slavery, colonialism, and nationalism. Same as AFR 1197. (IV)

HST 1623 West African History (Group D) 4 QH

Surveys the politics and economics of West Africa from the rise of the Mali Empire to the contemporary problems of national development for the countries from Senegal to Nigeria. Same as AFR 1403.

HST 1624 East African History (Group D) 4 QH

Covers the peoples and cultures of precolonial East Africa, their contacts with each other and the outside world, the impact of British and German colonial rule, the Mau Mau revolt and the struggle for independence, and the colonial heritage in contemporary East Africa. Same as AFR 1401.

HST 1625 South African History (Group D) 4 QH

Presents the historical background to current conflict in the Republic of South Africa and in adjoining Mozambique, Zimbabwe, and Namibia. Examines the rise of the apartheid system—and the opposition and alternatives to it—through the themes of racial conflict, nationalism, and industrialization in this African setting. Same as AFR 1405. (VI)

HST 1633 Modern China (Group D) 4 QH

Explores the far-reaching political, economic, and social changes in China from 1800 to the present. Examines the decline of the empire, the impact of the West, the rise of nationalism, industrialization, the changing role of women, the origins of rural revolution, and establishing the Communist state.

HST 1634 Contemporary China (Group D) 4 QH

Examines Chinese polity, society, and economy from 1949 to the present, including the restructuring of urban and rural society in the 1950s, the rise of a new class, the emergence of factionalism, the Cultural Revolution, and the impact of the post-Mao economic and political reforms.

HST 1637 Modern Japan (Group D) 4 QH

Surveys the evolution of Japan from a third-world nation to a superpower. Major themes include the breakdown of feudalism, the impact of the West, the Meiji Restoration, industrialization, militarism, and Japan's post-World War II modern economic miracle.

HST 1641 Recent Leaders of Asia (Group D) 4 QH

Uses biographies and films to illustrate the lives of Gandhi of India, Ho Ch'i-minh of Vietnam, Mao Zetong of China, and other Asian leaders and the role they played in influencing the revolt against their foreign colonizers. Major themes include the systems of foreign imperialism and the opposition of Asian nationalism.

HST 1644 Third World Women (Group D) 4 QH

Explores the role of women in the less-developed third world areas, with special emphasis on factors of change, development, and continuity. (IV)

HST 1652 Islam Resurgent (Group D) 4 QH

Analyzes what has been called "the militant revival of Islam" as a rallying point for reformist or revolutionary movements in the Muslim world. Includes little-known Muslim areas outside the Middle East in Africa and Asia. (VI)

HST 1701 Western Civilization (Honors) 4 QH

Honors equivalent of HST 1101.

HST 1702 Western Civilization 2 (Honors) 4 QH

Honors equivalent of HST 1102.

HST 1711 America to 1877 (Honors) 4 QH

Honors equivalent of HST 1201.

HST 1712 America since 1877 (Honors) 4 QH

Honors equivalent of HST 1202.

HST 1801 Directed Study 4 QH**HST 1805 Approaches to History 4 QH**

Students will undertake a major historical project based on the application of appropriate methodolo-

gies and upon the substantive understanding of a single subject chosen by the course instructor and announced in advance of the quarter. The course is rotated among the department's faculty. All history majors are required to take this course, though it is open to all upperclass students. All students must have completed 80 quarter-hours of work before taking this course.

HST 1811, HST 1812, HST 1813 **4 QH each**
Junior/Senior Honors Program

For details contact the Honors Office, 183 Holmes.

HST 1821 Fieldwork in History I **4 QH**

Offers directed work in historical societies, archives, museums, and other historical agencies. Students should consult the Department of History for details. *Prereq.* HST 1101, HST 1102, HST 1201, HST 1202, and 16 QH in other history courses.

HST 1822 Fieldwork in History 2 **4 QH**

Offers directed work in historical societies, archives, museums, and other historical agencies. Students should consult the Department of History for details. *Prereq.* HST 1821.

INT 1150 Introduction to Women's Studies: Image, Myth, and Reality **4 QH**

Provides an introduction to the study of women in society. Encompasses the historical, political, eco-

nomic, and social processes that have created both the image and reality of women in contemporary society and offers an overview of the many different disciplinary approaches to the study of women. Same as HST 1490. (II)

INT 1216 A History of Seafaring **4 QH**

This course surveys maritime transportation, trade, travel, exploration, and warfare from approximately 3500 B.C. to the end of the wooden boat era in the late nineteenth century. Prior to the widespread application of steam power on land and sea in the nineteenth century, ships were the fastest, safest, and most economical means of transporting large cargoes over long distances. Literary and art history sources are also introduced, along with several films on maritime archaeology.

INT 1252 Introduction to Irish Studies **4 QH**

Examines Ireland and Irish-America from the perspective of a number of fields in one-week sequences: art, business, drama, history, literature, music, politics, and sociology. Introduces students to the important forces that have helped to shape contemporary Ireland and Irish-American culture.

Interdisciplinary Courses

Numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 2.

INT 1110 American Musical Theatre **4 QH**

Offered by the Department of Drama and Music. Traces the development of the American musical from works such as *The Black Crook* to the present. Considers the role of musical theatre as both entertainment and serious art form through an examination of script, score, dance, and design. Includes works by composers and lyricists such as Bernstein, Rodgers and Hammerstein, the Gershwins, Weill, Lerner and Loewe, and Cole Porter.

INT 1150 Introduction to Women's Studies: Image, Myth, and Reality **4 QH**

This is an introductory survey of the issues and methodology involved in the interdisciplinary study of women. Such a survey encompasses the historical, political, economic, and social processes that have created both the image and the reality of women in society. Guest lecturers provide an overview of the many different disciplinary approaches to the study of women. This course is required for women's studies minors and may be used as either a general elective or, depending upon the discipline of the coordinator, to satisfy specific concentration requirements. (II)

INT 1151, INT 1152 Women's Studies: Seminars in Research **4 QH**

These interdisciplinary women's studies seminars allow students to address problems in depth by

researching a topic of particular interest. Careful development of a research plan is encouraged, and opportunities are provided for sharing work in progress and for exchanging findings. These findings involve little in-class time, but much consultation with appropriate faculty. The final product of seminar work and research is a major paper. Students in the Honors Program may substitute one quarter of honors registration for each seminar, but are still expected to attend the formal sessions of the seminar. These seminars are required for women's studies minors.

INT 1165 Special Topics in Sport and Society **4 QH**

Designed to augment a variety of courses offered in the area of sports studies. Content varies depending on the resources and staff available; previous offerings have examined the relationships between sports and the law and sports and business.

INT 1201 An Analysis of American Racism **4 QH**

This seminar in contemporary aspects of racism in America discusses the cycle by which racism in our institutions helps form our attitudes and the manner in which our attitudes, in turn, shape our institutions. Emphasizes the practical, day-to-day aspects of racism, rather than the theoretical and historical.

INT 1215 Into the Ocean World **4 QH**

This course is a comprehensive interdisciplinary introduction to the oceans. The seas' complexity and

the far-reaching consequences of our interactions with them demand an awareness of the many facets of marine study. The teaching team consists of specialists in the sciences, social sciences, humanities, and arts, each with an interest in marine issues and a commitment to bridging the gaps among disciplines. The course themes are as broad as the oceans, but, when appropriate, we focus on Boston harbor, a first step into the ocean world for those of us in this area.

INT 1216 A History of Seafaring 4 QH

This course surveys maritime transportation, trade, travel, exploration, and warfare from approximately 3500 B.C. to the end of the wooden boat era in the late nineteenth century. Prior to the widespread application of steam power on land and sea in the nineteenth century, ships were the fastest, safest, and most economical means of transporting large cargoes over long distances. Literary and art history sources are also introduced, along with several films on maritime archaeology.

INT 1217 Water: Planning for the Future 4 QH

This course is an interdisciplinary introduction to our most precious resource. Water has affected our bodies, our planet, our history, and our culture. How we manage it will shape our future. Because of increasing demand, waste, and pollution, we are depleting—and risk destroying—the limited supply of usable fresh water. This course will look at water through scientific, historical, and cultural viewpoints, and survey contemporary water problems in all their dimensions—political, economic, and technological. (VI)

INT 1252 Introduction to Irish Studies 4 QH

Presents Irish studies in one-week sequences from the perspective of a number of fields: art, business, drama, history, literature, music, politics, and sociology. Introduces students to the important forces that have helped to shape contemporary Ireland and Irish-American culture.

INT 1320 Exploring the Humanities Through Film 4 QH

Investigates the ways in which the methods of the humanities can expand one's awareness of the sources, statements, and meanings of popular films. Presents series of movies for evaluation in the light of readings, the various approaches presented by faculty members from a number of humanistic disciplines, and students' own experience. (II)

INT 1321 Modernism: Art, Film, and Literature 4 QH

Examines the interrelation of film, art, and literature in the major movements of the twentieth century to 1939. Studies Futurism, Cubism, Expressionism, Dadaism, and Surrealism, featuring European films, art, and literature in a comparatist perspective. Examines the persistence of modernist elements in contemporary art, literature, and film. Research paper or creative project due at the end of the term. Team-taught by members of the art, English, and modern languages departments.

INT 1330, INT 1331 Field Experience in Human Services 1 and 2 4 QH each

Human services students are required to fulfill two fieldwork placements during the last two years of their program. Each placement consists of 150 hours on-site and generally varies according to the students' interest. Examples of placement sites include community centers, nursing homes, vocational workshops, state and federal agencies for children, and recreational facilities. Experiences are supervised by University staff to maximize the students' learning opportunities. *Junior or senior status, by permission only.*

INT 1333 Senior Seminar in Human Services 4 QH

Designed for seniors in human services, the course examines emerging roles and career options within the human services field. Study will focus on self-examination of attitudes and values affecting delivery of services, exploration of ethical issues and dilemmas relevant to human services, grantsmanship and funding issues, staff supervision and development within human services agencies, and refinement of group leadership skills.

INT 1340 Cultural Aspects of International Business 4 QH

Using a managerial perspective, this course covers issues that arise when a firm moves from its home country to a host country that may have a different national culture. Although it will usually assume the perspective of the United States-based firm that operates abroad, it will spend some time on what happens to other national firms operating in the United States and in third-country environments. The way in which "corporate culture" evolves, in the context of national culture and the impact on managers, will be a central issue. *Prereq. Middler standing.*

INT 1400 Professional Practices: Individual and Social Dimensions 4 QH

Explores the dimensions and dilemmas of freedom and responsibility confronting professional people practicing within limits set by socioeconomic conditions, by clients, and by other professionals. Examines case histories to illustrate the dilemmas professionals face, choices typically made, and the consequences these have on the freedom of the practitioner and on personal and professional integrity.

INT 1401 Health Professionals: Past, Present, and Future 4 QH

Focuses on social history of the modern health professions. Explores long-range patterns in the organization and regulation of the health professions, beginning with the Middle Ages and emphasizing the Jacksonian period, industrialization, modern professional organizations, the growing role of the state, responses of the health professions, and the future of health care in the United States under various corporate/government schemes for reorganization and "accountability."

INT 1580 Physical Chemistry with Biological Applications 4 QH

Examines physiochemical principles as they apply to biological processes. Topics include chemical equi-

libria, reaction kinetics, basic thermodynamics, oxidation-reduction reactions and bioenergetics, and transport. Emphasizes problem solving as a tool for learning, using a quantitative approach. Explains basic assumptions and limitations underlying principles; for the most part, however, rigorous derivations are avoided. Makes applications to basic experimental techniques in biochemistry by way of relevant biochemical examples. *Prereq.* BIO 1261.

INT 1700 War and Conflict in the Nuclear Age (Honors) 4 QH

Honors equivalent of INT 1140. Discusses the development of nuclear weapons. Explores the decisions leading to and the aftermath of the nuclear attack on Hiroshima and Nagasaki. Examines the Cold War and the growth of nuclear arsenals, the potential causes of a nuclear war and the probable effects, and this issue's moral questions. Evaluates strategies for preventing nuclear war.

INT 1702 War Work: The Experience of World War II (Honors) 4 QH

Examines the Second World War as an example of the impact external events can have on professions. This upperclass course is team-taught by faculty from various disciplines.

INT 1703 Environmental Policy (Honors) 4 QH

Evaluates law, policy, and scientific decision making in resolving environmental resource conflicts and in dealing with the health risks of new technologies. Introduces regulatory approaches including the Clean Water Act, wetlands protection, and toxic torts litigation.

INT 1704 Northeastern in the 1960s (Honors) 4 QH
Explores how college life and curricula have changed over the past twenty years by studying the microcosm of Northeastern University. Involves research papers on topics such as curriculum changes, student values as reflected in literature and folklore, and the Northeastern riots in comparative context.

INT 1705 Greek Language and Literature (Honors) 4 QH
Focuses on Attic Greek grammar and selections from Greek literature in the original language. Discussion of texts is major part of course.

INT 1706 Industrial Relations (Honors) 4 QH
Presents theories and applications of labor management relations through lectures and case discussions. Focuses on the development of American and European labor movements, emphasizing legal and economic factors. Topics include union objectives, organization, and structure; union government and democracy; collective bargaining; and management approaches to industrial relations.

INT 1707 Psychoanalytic Literature (Honors) 4 QH
Examines literature from a psychoanalytic perspective. Topics include Freud's theories, object relations, Lacan's theories, and Kohut's self-psychology. Discusses works by Charles Dickens, Franz Kafka, Virginia Woolf, Doris Lessing, and Anne Tyler.

INT 1721 Modernism: Art, Film, and Literature (Honors) 4 QH
Honors equivalent of INT 1321.

Journalism

Please note that some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Office of the Dean before taking the course.

Numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 2.

JRN 1103 Newswriting I 4 QH

Covers functions of the editorial department and procedures in obtaining and writing news stories. Offers extensive news writing and an introduction to interviewing. Legal issues defined. Typing skills required. *Prereq.* ENG 1275 with grade of C or better.

JRN 1104 Newswriting 2 4 QH

Offers practice in multi-source and breaking stories. Provides an introduction to government and court reporting, advanced work in interviewing, and experience in writing under deadline pressure. Discusses legal issues. *Prereq.* JRN 1103 with grade of C or better.

JRN 1206 Editing 4 QH

Provides practice in copy editing and headline writing. Presents assignments in photo selection, crop-

ping, and outline writing. Introduces page layout. *Prereq.* JRN 1104 with grade of C or better.

JRN 1250 Interpreting the Day's News 4 QH

Considers the news of the day and the function of the newspaper, news magazine, and news broadcasts in American life. Topics include rights and responsibilities of the press and how news is gathered, processed, and disseminated by the various media. (VI) *For nonmajors as well as majors.*

JRN 1301 Basic Photojournalism 4 QH

Covers camera and darkroom procedures along with cropping, assignment techniques, theory, and photo caption methods. *Prereq.* JRN 1104.

JRN 1305 Techniques of Journalism 4 QH

Provides practice in writing in-depth and multiple-source stories requiring significant research. Provides an introduction to investigative reporting,

practice in feature writing, and a review of legal issues. *Prereq.* JRN 1104.

JRN 1320 Radio News Gathering and Reporting 4 QH
Covers writing and editing news for radio, with practice in interviewing, organizing news scripts, and integrating audio materials into broadcast. *Prereq.* JRN 1103.

JRN 1336 Public Relations Principles 4 QH
Presents the principles, history, and methods of public relations, processes of influencing public opinion, responsibilities of the public relations practitioner, and analyses of public relations programs. *Prereq.* *Sophomore standing.*

JRN 1350 Advertising Principles 4 QH
Covers the development, procedures, economic functions, and responsibilities of advertising: planning, research, production, and other elements that go into successful advertising. *Prereq.* *Sophomore standing.*

JRN 1421 Television News Writing 4 QH
Covers writing for TV news as opposed to other news media, importance of the writer-reporter as field-producer and writer-producer, and terms and language used in the production of TV news shows. Includes actual individual production of news shows, field trips to TV stations, and guest lecturers from the TV news media. *Prereq.* JRN 1103.

JRN 1422 Television News Production 4 QH
Demonstrates techniques used by the electronic journalist and TV news producer. Provides the opportunity to build a TV news show and to do reporting with portable TV cameras and editing equipment. *Prereq.* JRN 1103 and JRN 1421, or permission of instructor.

JRN 1428 The Role of Journalism in Sports 4 QH
Offers an analysis of the impact of journalism on the institution of sports in this country and around the world. Considers sports reporting as a motivator and demotivator from Little League to college and professional levels. Looks at the effect of news media coverage on violence in organized sports, on America's physical fitness, and on other aspects of society.

JRN 1430 Fundamentals of Sports Reporting 4 QH
Applies principles of news reporting to covering men's and women's sports for print and broadcast media. Emphasizes using sports reference materials, developing contacts, interviewing, and structuring the sports story. Also discusses investigative reporting in sports. *Prereq.* JRN 1104.

JRN 1432 Local Government Reporting 4 QH
Discusses coverage of town/city government, with emphasis on the "beat" approach to reporting public affairs. Focuses on practical, in-the-field experience with town meetings, meetings of boards of selectmen, and other commissions and bodies transacting public business. *Prereq.* JRN 1104.

JRN 1440 Design and Graphics 4 QH
Applies layout and design principles to newspapers, magazines and other print media. Covers type faces,

copy measuring, dummies, photo sizing, and keeping copy flow charts. Applies design and graphics principles to advertising layout. *Prereq.* JRN 1206.

JRN 1451 Advertising Copy Writing 4 QH
Covers theory and techniques of creating advertising copy for newspapers, magazines, radio, television, and direct mail. Emphasizes fact gathering, copy structure, and advertising design. *Prereq.* JRN 1103, and JRN 1350.

JRN 1460 Public Relations Problems 4 QH
Applies public relations techniques to actual problems; presents case studies in industry, labor, education, government, social welfare, and trade associations. *Prereq.* JRN 1336.

JRN 1501 History of Journalism 4 QH
Traces the development of American journalism from its European and English beginnings. Topics include the colonial press, the great personal journalists of the nineteenth century, and the impact of major technological changes in mass communications media in the twentieth century. Some writing required. *Prereq.* *Upperclass standing.*

JRN 1508 Law of the Press 4 QH
Examines legal problems of libel, invasion of privacy, and access to government information; discusses the balance between private rights and the public's "need to know." *Prereq.* *Upperclass standing.*

JRN 1512 Journalism Ethics and Issues 4 QH
Explores the responsibilities of news media and ethical issues confronting decision-makers in journalism. Examines the principles found in codes of the American Society of Newspaper Editors, the Associated Press Managing Editors, the Society of Professional Journalists, and other organizations. Some writing required. *Prereq.* JRN 1501.

JRN 1522 Magazine Writing 4 QH
Covers writing and free-lancing magazine articles; analyzing magazines as markets; and selecting the best feature format—how-to-do-it, profile, personal experience, human interest, interpretive pieces, and others. *Prereq.* JRN 1104 or consent of instructor.

JRN 1530 Advanced Reporting 4 QH
Covers advanced investigative and team reporting, series stories and research, precision reporting. *Prereq.* JRN 1104.

JRN 1540 Sports Public Relations 4 QH
Covers the planning and implementing of public relations functions for professional, amateur, and recreational athletic organizations. Topics stressed include use of journalistic research techniques, implementation of programs, and effective communication with news media and various publics. *Prereq.* JRN 1103, and JRN 1336.

JRN 1552 Advertising Practice 4 QH
Covers the preparation of advertising for print and broadcast media, including campaign planning and space and time buying and scheduling. Includes product research, consumer surveys, and measuring the effects of advertising. *Prereq.* JRN 1451.

JRN 1561 Public Relations Practice 4 QH

Demonstrates practices and techniques employed in the field, including organization of events and functions. Studies campaign planning, research, and media relationships. *Prereq.* JRN 1103 and JRN 1336.

JRN 1575 Publication Production and Management 4 QH

Examines the organizational structure, production methods, and management procedures of print media companies. Analyzes the interaction of business, advertising, production, and circulation departments. *Prereq.* JRN 1206.

H JRN 1617 The Constitution and Mass Communications 4 QH

Explores the meaning of freedom of the press through study and discussion of the evolving First-Amendment interpretations of the United States Supreme Court. *Prereq.* Upperclass standing.

JRN 1635 Journalism and the Mass Media 4 QH

Presents seminars featuring well-known professionals from major newspapers, radio-TV stations, wire

services, magazines, photography, and public relations. Offers an up-to-date, in-depth exploration of techniques and theories used in various media.

JRN 1703 Newswriting 1 (Honors) 4 QH

Honors equivalent of JRN 1103.

JRN 1704 Newswriting 2 (Honors) 4 QH

Honors equivalent of JRN 1104.

JRN 1870, JRN 1880 Seminar 4 QH

Offers discussions and readings on topics of current significance in various journalistic fields. *Prereq.* Upperclass standing.

JRN 1890, JRN 1891 4 QH each

Directed Study in Journalism

JRN 1892 Topics 4 QH

JRN 1894, JRN 1895, JRN 1896, JRN 1897, 1898 4 QH each
Honors in Journalism

Linguistics

The following linguistics courses are described under the different department headings. The interdepartmental major in linguistics and its corresponding minor are described on page 7 of this catalog.

English

ENG 1118 Introduction to Language and Linguistics

ENG 1119 History of the English Language

ENG 1401 Introduction to Syntax

ENG 1402 Grammars of English

ENG 1407 Introduction to Semantics

ENG 1408 Topics in Linguistics

ENG 1690/ENG 1691 Seminar in Stylistics
or Linguistics

ENG 1810/ENG 1811 Directed Study

Modern Languages

LNG 1801 Directed Study

LNL 1235 Applied Linguistics

LNL 1236 Applied Linguistics 2

Philosophy and Religion

PHL 1215 Symbolic Logic

PHL 1440 Philosophy of Language

PHL 1800 Directed Study

Psychology

PSY 1261 Bilingualism

PSY 1262 Language and Cognition

PSY 1263 Nonverbal Communication

PSY 1264 Animal Communication

PSY 1361 Introduction to Phonetics

PSY 1362 Child Language

PSY 1363 Linguistics of American Sign Language

PSY 1364 Cognition

PSY 1365 Language and the Brain

PSY 1562 Lab in Psycholinguistics

PSY 1661 Seminar in Psycholinguistics

PSY 1662 Seminar in Cognition

PSY 1890 Directed Study

Sociology/Anthropology

SOA 1135 Language and Culture

SOA 1800 Directed Study

Modern Languages

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Office of the Dean before taking the course.

Prerequisites listed for modern languages are based on current course numbers at Northeastern. If approved by the Department of Modern Languages and the dean's office, equivalent course work acquired elsewhere may be considered acceptable to satisfy these prerequisites. The following courses are offered in English, and no knowledge of a foreign language is required to take them: LNF 1510, LNF 1511, LNF 1512, LNF 1513, LNI 1510, LNI 1511, LNI 1512, LNR 1500, LNR 1510, LNR 1511, LNS 1500, LNS 1501, and LNS 1510. Locate these courses under the appropriate heading for course descriptions. Language majors interested in obtaining major credit for any of these courses should consult their instructor.

Film

The following film courses are offered by the Department of Modern Languages. For additional film courses, consult the film listings.

LNF 1321 French Film Masterpieces

4 QH

Provides an introduction to some of the qualities that have made French film one of the great national cinemas. Focuses on both form and content; relates outstanding directors' major works to the French culture and society of their period. Taught in English; may be taken for French credit if assignments are completed in French. (Also listed as FLM 1321.)

LNF 1550 Introductory Film Analysis

4 QH

The course's major goal is the cultivation of critical skills in analyzing the film medium, enabling students to articulate ways in which film shapes their experience. The course will be presented in three units: Film Form, Narrative Form, and Film Style. Form, and its most prevalent manifestation, narrative form, can be said to be the way in which the parts of a film are related to one another to create a whole. Style, including mise-en-scène, cinematography, editing, and sound, will be studied in relation to audience expectations and the constitutive role of film form. The course will be organized around weekly film screenings and individual study of films put on reserve in the video section of the Learning Resource Center of Dodge Library.

LNF 1551 Film Theory

4 QH

Investigates the fundamental issues surrounding the nature and possibilities of film art. Introduces a variety of theoretical approaches, including semiotics, auteur theory, psychoanalysis, and feminism. Weekly screenings focus on two or three topics: a film author (such as Buñuel, Truffaut, or Welles), a well-defined film movement (such as neorealism, the New German cinema, or the French New Wave), or films about film-making practice. Coursework includes reading articles and writing a research paper using the resources (including film journals) of Dodge Library. (V)

LNF 1560 Film and Psychoanalysis

4 QH

This course will explore the nature and possibilities of the psychoanalytic interpretation of film. The course will demonstrate that such an approach

offers an additional dimension to the analysis of a work of art. The principal focus will be on elements in the work that are derivative of unconscious processes. Thus, fantasies, dreams, symbolism, and imagery will be given special attention. Material in the works studied that relates to neurotic conflicts, character structure and formation, interpersonal relationships, and distortions in psychological development will be brought into the discussion. Weekly film screenings will be accompanied by lectures and discussions; each student will select one film (placed on reserve in the Learning Resources Center of Dodge Library) for individual study on a topic of his/her choice. (Also listed as FLM 1260.)

LNS 1550 Spanish Film Masterpieces

4 QH

Covers Spanish cinema from 1960 to the present, focusing on recognized masters such as Buñuel and Saura, but including other award-winning films based on novels and events in the Spanish Civil War. Stresses the way the realism of the Spanish cinema is combined with surrealist imagery and metaphor to create a distinctive visual style and content.

The following courses offered in the Department of Modern Languages are conducted in English for possible advanced language credit. Please consult instructor.

LNF 1510 Modern Philosophical French Literature in Translation

4 QH

Camus and Sartre are considered to have been the spokesmen for their generation's philosophical concerns. The course studies works by these two authors and from them develops a working knowledge of existentialism. Course given in English.

LNF 1511 The Theme of Solitude in French Literature

4 QH

The multiple facets of the theme of solitude are traced from the beginnings of French literature to the present. Viewed as a source of both wonder and anguish, solitude is studied in its various manifestations, including banishment, imprisonment, expatriation, and seclusion. The phenomena of moral and spiritual solitude are examined as well. Authors studied include Charles d'Orleans, Du Bellay, Rousseau, Chateaubriand, Hugo, Verlaine, Mauriac, and Camus.

Course conducted in English. Texts read in English translation (those who wish to do so may read them in French).

LNF 1512 Masterpieces of Modern European Fiction 4 QH
Focuses on modern European authors, including Dostoevski, Mann, Kafka, Proust, Gide, and Camus. Views their works as commentaries on their respective societies and, more generally, as investigations of the human condition. Conducted in English.

LNF 1513 French Seminar: Voltaire and Rousseau 4 QH
This course offers an opportunity to study and compare the two great figures of the eighteenth century. Analyzes how, by their contrasting interests, personalities, and views of society, these writers contributed to fundamental changes in the political, philosophical, and literary world of their time—and ours. Includes class discussion, oral and written reports. Conducted in English. Offered in alternate years.

LNI 1510 The Works of Dante in Translation 1 4 QH
This course considers briefly the cultural background and various literary schools that influenced Dante. His life, his character, and minor works are discussed. The *Vita Nuova* and the first cantica of the *Divina Commedia*, the “Inferno,” are read and analyzed in some detail. This course is intended for students of any background or major. Bilingual texts are used so that students with a background in Italian and others, may refer to the original for added interest and enrichment. Classes are conducted in English. (III)

LNI 1511 The Works of Dante in Translation 2 4 QH
Continues LNI 1510, but may be taken separately. Studies in detail the other two parts of the *Divina Commedia*, “Purgatorio” and “Paradiso.” Open to anyone. Bilingual texts used. Conducted in English.

LNI 1512 Italian Seminar: Pirandello 4 QH
By viewing reality in the world and human personality with strikingly new insights, Pirandello contributed a new dimension to our understanding of human nature and brought about significant changes to the traditional conception of the theatre. This course examines the originality and art of Pirandello by a close study of some of his great plays and short stories. Classwork includes discussions and oral and written reports. Conducted in English. Offered in alternate years.

LNR 1500 Backgrounds in Russian Culture 4 QH
Designed to offer the student a view of Russian culture and civilization; includes guest speakers, films, field trips, and discussions. Conducted in English.

LNR 1510 The Works of Alexander Pushkin 4 QH in Translation
Offers a survey and analysis in English of Pushkin's artistic prose, lyric poetry, correspondence, friendships, and major literary influences.

LNR 1511 Russian Literature in Translation 4 QH
A companion to LNR 1510; provides a survey and analysis in English of some of the works of Tolstói, Dostoevski, Chekhov, and others.

LNS 1500 Backgrounds in Hispanic Culture 4 QH
A multimedia approach is used to present the rich panorama of the humanities from Altamira to modern times. A reading knowledge of Spanish is helpful but not required, since the course is conducted in English. Field trips, concerts, guest speakers, and individual study projects enhance this exploration of Spanish creativity.

LNS 1501 Backgrounds of Latin American Culture 4 QH
Spans the time from pre-Columbian days to the present in Latin America, exploring culture, traditions, and attitudes. Offers a multimedia approach with field trips and guest lecturers. Conducted in English. (IV)

LNS 1510 Saints and Sinners: The Vision of Women in the Middle Ages and the Renaissance 4 QH
Topics include the attainment of and the atonement for love and society's changing attitude toward women as reflected in the literature of the times. Covers selected fabliaux, short stories, poems, and plays from Boccaccio, Chaucer, Ruiz, Rojas, Machiavelli, Lope de Vega, Calderon, Quevedo, Racine, Middleton, as well as women writers. Reference is made to historical and sociological materials. Conducted in English. All required readings are in translation.

LNS 1511 Introduction to Caribbean Literature 4 QH
Provides a comparative introduction to the modern literary traditions of the Spanish-, English-, and French-speaking Caribbean. Includes authors such as Carpentier (Cuba), Naipaul (Trinidad), Zobel (Martinique), and Cardenal (Nicaragua).

LNS 1512 The Don Juan Figure in Literature 4 QH
This seminar course deals with the emergence and development of the Don Juan figure in Western literature. The course will be taught in English, although it will focus upon many works which were originally written in other languages (they will be read in English translation). It will attempt to analyze the character of Don Juan, beginning with his first appearance in the theater of seventeenth-century Spain, and following his development well into the twentieth century. The course will strive to develop an appreciation and understanding of the character of Don Juan through the centuries, and to analyze the similarities and the differences that may be seen in the character from one cultural milieu to another. (III)

Chinese

LNC 1101 Elementary Chinese 1 4 QH
Designed to acquaint the student with features of spoken and written “Mandarin” Chinese. Stresses grammar, oral performance, and simple characters. Students who wish to speak another dialect of Chinese should consult instructor for proper placement.

LNC 1102 Elementary Chinese 2 4 QH
Continues LNC 1101. Studies grammar and spoken and written forms of the language. *Prereq.* LNC 1101.

LNC 1103 Intermediate Chinese 1 4 QH
Continues LNC 1102. Covers more advanced features of the language as well as continued study of characters. *Prereq.* LNC 1102.

LNC 1104 Intermediate Chinese 2 4 QH
Continues LNC 1103. Offers more advanced work in grammar, conversation, and characters. *Prereq.* LNC 1103.

LNC 1801 Directed Study in Chinese 4 QH

French

LNF 1101 Elementary French 1 4 QH
Designed for students with very little or no prior knowledge of French, this course provides a lively introduction to basic oral expression, listening comprehension, and elementary reading and writing. The audiolingual approach, using practical vocabulary drawn from realistic situations, aims at good pronunciation and ease in response. Each lesson incorporates helpful information about daily life in France and the varied cultures within the world of French speakers. Laboratory practice complements classwork, enables students to work aloud at their own speed, reinforces their acquisition of essential structures, and acquaints them with a vast library of audiovisual resources.

LNF 1102 Elementary French 2 4 QH
Continues beginners' exposure to the "four skills"—oral comprehension, speaking, reading, and writing French—so that the linguistic tools needed to understand and function in foreign contexts—at home, abroad, and in the world of literature and film—may be acquired. *Prereq.* LNF 1101.

LNF 1103 Intermediate French 1 4 QH
Designed for students who wish to further their audiolingual skills and improve their reading and writing; combines a review and continued study of grammar essentials with oral, writing, and language lab practice. Varied readings include journalistic, cultural, and modern literary texts. Conducted primarily in French so that students may exercise their new skills. *Prereq.* LNF 1102 or *equiv.*

LNF 1104 Intermediate French 2 4 QH
This course uses the fundamentals of French to promote effective self-expression through speaking and writing and to explore the idiomatic aspects of the language. Through progressive class discussions and oral and written commentaries, students analyze a contemporary French novel or a French cultural reader, screenplay, or collection of short stories. The course strives, first, to help students read and comprehend modern French writing with confidence, and to be able to talk and write about it in good French; and second, to provide preparation for advanced courses. *Prereq.* LNF 1103.

LNF 1107 Reading French in the Arts and Sciences 4 QH
Designed for students who wish to develop their reading skills, without regard to other aspects of the language such as speaking and writing. Stresses the grammar necessary for reading, together with vocab-

ulary building. Uses scientific and nonscientific texts. May help graduate and undergraduate students who need to pass a reading examination to fulfill specific degree requirements. *Not* a substitute for LNF 1103 or LNF 1104. *Prereq.* LNF 1102 or *equiv.*

LNF 1111 Elementary French for Business 4 QH
Similar to LNF 1101, but has added features relevant to business students, such as specialized vocabulary related to the business world and an immediate introduction to French business texts. LNF 1102 can be taken as a sequel to LNF 1111.

LNF 1201 French Composition and Conversation 1 4 QH
This course is designed for qualified students who wish to work on improving their proficiency in speaking and writing French through oral reports, class discussions, compositions, and an advanced review of fundamentals. Grammar work focuses on the students' particular needs as well as the nuances of the language. Varied readings in a range of styles—popular to literary—provide insight into French life and culture. Conducted in French.

LNF 1202 French Composition and Conversation 2 4 QH
Continues LNF 1201, with emphasis on individual work, oral presentations, discussions, related grammar, and analysis of readings. Conducted in French. *Prereq.* LNF 1201 or *equiv.*

LNF 1203 Advanced French Proficiency 1 4 QH
Emphasizes further vocabulary building and mastery of fine points of grammar through written composition, prepared oral reports, and reading and discussion of articles from current periodicals. Gives special attention to the latest trends in spoken French, the study of idioms and proverbs, as well as selected examples of "argot" (slang). *Prereq.* LNF 1201 and LNF 1202 or *equiv.*

LNF 1204 Advanced French Proficiency 2 4 QH
Continues LNF 1203. Each student is expected to pursue one major project throughout the course, to be completed at the end of the quarter—such as planning and writing an original French magazine with one article to be submitted each week of the term. *Prereq.* LNF 1201 and LNF 1202 or *equiv.*

LNF 1225 Introduction to the French-Speaking World 4 QH
Offers a cultural introduction to the French-speaking world through the study of various reading selections in the textbook *Le Monde Français*. Stresses vocabulary building and proper usage of a wide variety of grammatical forms; also examines the traditional backgrounds and aspects, as well as the contemporary and "pop" aspects, of the cultural heritage of the world's French speakers. Focuses mainly, but not exclusively, on France. *Prereq.* LNF 1104 or *equiv.*

LNF 1231 Masterpieces of French Literature 1 4 QH
Provides an introduction to French poetry, theatre (both comedy and tragedy), novels, and autobiographies through the study of key works from the Middle Ages and Renaissance through the Age of Enlightenment. Includes such writers as Villon, Molière, Racine, Voltaire, and Rousseau. Conducted largely in French. Designed to foster a critical approach to

reading, improve reading, speaking, and writing skills; and help students apply these new skills to a greater understanding and appreciation of major French contributions to Western culture. Encourages group discussions in an effort to bring out the relation between the texts and contemporary issues. (II) *Prereq.* LNF 1104 or *equiv.*

LNF 1232 Masterpieces of French Literature 2 4 QH

Continues LNF 1231, which is not necessarily a prerequisite. Presents some of the most interesting and significant works of literature from the Romantic Age to the present. Readings include an "existential" play by Musset, poetry by Baudelaire and Verlaine, and fiction by Flaubert, Camus, and Robbe-Grillet. For a description of methodology, see LNF 1231. (II) *Prereq.* LNF 1104 or *equiv.*

LNF 1305 French Literature in the Seventeenth Century 4 QH

Presents a study of the nondramatic literature of seventeenth-century France from the baroque through the classical periods. Covers a rich and diverse body of writing encompassing philosophy, poetry, the table, the novel, and epistolary writing. Among the authors treated are Descartes, Pascal, La Rochefoucauld, La Fontaine, Boileau, Mme. de Sévigné, and Mme. de La Fayette. Offered every other year. *Prereq.* LNF 1232 or *equiv.*

LNF 1306 French Theatre in the Seventeenth Century 4 QH

Studies the dramatic literature of seventeenth-century France, from the baroque through the classical periods. Studies tragedy in the works of Corneille and Racine; comedy, in those of Molière. Offered every other year. *Prereq.* LNF 1232 or *equiv.*

LNF 1307 French Literature of the Eighteenth Century 1 4 QH

The eighteenth century in France, known as the Age of Enlightenment, was an age of challenge to established authority in all areas and an age of changing ideas and ideals. This intellectual and political vitality is reflected in the representative works of Marivaux, Montesquieu, Prevost, and Voltaire. Classwork includes discussions, oral and written reports. Conducted in French, but English is allowed. Offered every other year. *Prereq.* LNF 1232 or *equiv.*

LNF 1308 French Literature of the Eighteenth Century 2 4 QH

Toward the latter half of the century we begin to see both the achievements brought about by the spirit of enlightenment and the awakening of the romantic sensibility, in such authors as Diderot, Rousseau, St. Pierre, Laclos, and Beaumarchais. Classwork includes discussions, oral and written reports. Conducted in French, but English is allowed. Offered in alternate years. *Prereq.* LNF 1232 or *equiv.*

LNF 1309 French Literature of the Nineteenth Century 1 4 QH

Romanticism is treated as a major cultural phenomenon affecting each person's view of the world and the way he/she expresses experience. In this context, the course examines romanticism in poetry and drama, as well as its continuation into the realist

novel. Readings include Victor Hugo in poetry and the drama and Honoré de Balzac in the novel, as well as selections from other writers who represent aspects of romanticism and realism. Conducted principally in French. Offered every other year. *Prereq.* LNF 1232 or *equiv.*

LNF 1310 French Literature of the Nineteenth Century 2 4 QH

Explores the reaction against romanticism: aestheticism and personal modes of expression in contrast to the enthusiasm of the early romantics. Readings include a novel by Gustave Flaubert and the verse of Charles Baudelaire in *Les Fleurs du Mal*, as well as the poets who followed in his footsteps. Considers Flaubert and Baudelaire as precursors of modern literature. Conducted principally in French. Offered every other year. *Prereq.* LNF 1232 or *equiv.*

LNF 1311 French Literature of the Twentieth Century 1 4 QH

Offers a study of the major movements in the narrative and dramatic prose writers prior to World War 2, including Alain-Fournier, Proust, Claudel, Gide, Mauriac, and Saint Exupéry. Requirements include reading a work from each author, discussing it in class, and presenting oral and written reports. Conducted in French, but English may be used. Offered in alternate years. *Prereq.* LNF 1232 or *equiv.*

LNF 1312 French Literature of the Twentieth Century 2 4 QH

Focuses on the trends in postwar fiction, with particular consideration of the struggle to find meaning in an absurd world. Analyzes significant works by Giraudoux, Montherlant, Sartre, Camus, Anouilh, Ionesco, and Beckett. Classwork includes oral and written reports, class discussions. Conducted in French, but English may be used. Offered in alternate years. *Prereq.* LNF 1232 or *equiv.*

LNF 1315 French Poetry, Past and Present 4 QH

From the Middle Ages to the present day, French poets have derived inspiration from such universal themes as love, nature, and the human condition. This course will provide students with a survey of French poetry through the ages, focusing on representative works of the major French poets. Poems will be studied in their literary and historical context, with an examination of various aspects of French versification. Conducted in French.

LNF 1400 Seminar: Critical Methodology and Practice in French Literature 4 QH

Treats one modern French writer in terms of a critical methodology developed in the first part of the seminar based on modern critical practice. *Prereq.* Excellent reading knowledge of French.

LNF 1401 Seminar: Trends in Modern French Literature 4 QH

Examines a trend in modern French literature and develops a critical methodology useful for this analysis. *Prereq.* Excellent reading knowledge of French.

LNF 1801, LNF 1802, LNF 1803, LNF 1804, LNF 1805 Directed Study 4 QH each

Offers students a way of going beyond work given in the regular curriculum; may also enable students to complete major or minor requirements in certain situations. Will not be given in areas adequately covered by existing courses. Priority given to language majors and to juniors and seniors.

LNF 1820, LNF 1821, LNF 1822, LNF 1823 Junior/Senior Honors Program 4 QH each

For details contact the Honors Office, 183 Holmes.

German

Prerequisites listed for modern languages are based on current course numbers at Northeastern. Equivalent coursework done elsewhere will be considered acceptable to satisfy these prerequisites.

LNG 1101 Elementary German 1 4 QH

This course is designed to provide instruction in the basic grammatical structure of German through practice in listening comprehension, speaking, reading, and writing. Instruction is provided in the classroom and in the language lab. No previous study of German necessary. (Special sections of this course are run for business students.)

LNG 1102 Elementary German 2 4 QH

A continuation of LNG 1101, this course emphasizes helping students to increase their knowledge of the basic grammatical structure of German and to develop additional flexibility in the four language skills. (Special sections of this course are run for business students.) *Prereq.* LNG 1101 or equiv.

LNG 1103 Intermediate German 1 4 QH

Offers a comprehensive review and reinforcement of the major aspects of German grammar and usage; continues to explore the four major skills of listening comprehension, speaking, reading, and writing; introduces the student to the reading of contemporary literary texts, including a full-length play—*Biedermann und die Brandstifter*, by the Swiss playwright Max Frisch. *Prereq.* LNG 1102 or equiv.

LNG 1104 Intermediate German 2 4 QH

The course aims at helping students enlarge vocabulary and develop increased flexibility in the four basic language skills. Included are completion of grammar review, continued exposure to modern literary texts. One full-length play is read—*Der Besuch der alten Dame*, by the contemporary Swiss dramatist Friedrich Dürrenmatt. Successful completion of this course entitles the student to choose from among the upper-level course offerings in the areas of German literature and/or composition and conversation. *Prereq.* LNG 1103 or equiv.

LNG 1107 Reading German 4 QH

This course is designed for those students who wish to develop their reading skills, without regard to other aspects of the language, such as speaking or writing. The grammar necessary for reading is stressed, together with vocabulary building; scien-

tific and nonscientific texts are read. This course may provide assistance to students, graduate and undergraduate, who need to pass a reading examination to fulfill specific degree requirements.

LNG 1111 Business German 1 4 QH

Provides an introduction to written German in business administration usage as found in general-purpose professional texts. Develops grammatical knowledge and competence in reading comprehension, translation, and phonetic accuracy. Considers the Federal Republic of Germany as an internationally leading economic power. Discusses weekly readings (in English) from trade publications on aspects of the German business world, including foreign and U.S. trade. Assumes no prior knowledge of German.

LNG 1201 German Composition and Conversation 1 4 QH

This course strives to develop facility in speaking and writing German and stresses active use of the language. Students are provided an opportunity for practice in listening comprehension through German language films or tape-recorded interviews with native German speakers; expansion of vocabulary through guided group discussions on topics of general interest; and development of language skills in areas of individual interest through preparation of oral reports in German. Compositions are assigned on a weekly basis and grammar is reviewed as needed. Utilization of language lab. Recommended for students preparing for co-op in Germany. *Prereq.* LNG 1104 or equiv.

LNG 1202 German Composition and Conversation 2 4 QH

Continuation of German LNG 1201 in content and format with emphasis on independent communication skills. Recommended for students preparing for co-op in Germany. *Prereq.* LNG 1201 or equiv.

LNG 1203 Advanced German Proficiency 1 4 QH

The course offers intensive training in spoken and written German with the aim of providing students an opportunity to increase vocabulary and develop flexibility in the use of the language. Included are student-led discussions of German society and current affairs based on readings of current journals and periodicals; weekly written assignments; review and practice of grammar where necessary. *Prereq.* LNG 1201 and LNG 1202, or permission of instructor.

LNG 1231 Masterpieces of German Literature 1 4 QH

The course includes a survey of the major trends in the development of German literature from the Hildebrandslied to Martin Luther. In addition, reading of selected works of major authors of the twentieth century such as Hauptmann, Kafka, Mann, Brecht, Dürrenmatt, and Boll. Choice of works to be read in a particular term will be based partially on theatre performances or film showings planned in the Boston area. Class attendance of these performances is anticipated. Recommended as an introductory step to literature courses LNG 1307 and above. Offered every other year, alternating with LNG 1232. *Prereq.* LNG 1104 or equiv.

LNG 1232 Masterpieces of German Literature 2 4 QH

Studies short fiction from Goethe to the present. Includes Goethe's *Die Leiden des Jungen Werthers*, ETA Hoffman's stories of fantasy and madness, Thomas Mann's *Der Tod in Venedig*, and Franz Kafka's *Die Verwandlung*, as well as stories by Böll, Grass, Christa Wolff, and others. Complements readings and lectures in German with musical and screen adaptations of the works. Recommended as an introduction to literature courses LNG 1307 and above. May be taken before LNG 1231. *Prereq.* LNG 1104 or *equiv.*

LNG 1307 Classical Period of German Literature 4 QH

The course provides background and general survey of the period from 1750 to 1800, with particular emphasis on the works of Lessing and Schiller. Among the dramas read are Lessing's *Minna von Barnhelm* and *Nathan der Weise*, and Schiller's *Maria Stuart* and *Die Jungfrau von Orleans*. Lectures (in German) and reports. *Prereq.* LNG 1232 or *equiv.*

LNG 1308 The Works of Goethe 4 QH

Studies drama, prose writing, and lyric poetry of Goethe: *Faust*, Part 1; *Hermann Und Dorothea*; *Egmont*; and *Iphigenie auf Tauris*. Lectures (in German) and reports. *Prereq.* LNG 1232 or *equiv.*

LNG 1309 German Literature of the Nineteenth Century 4 QH

The course offers background and general survey of German literature of the nineteenth century, with particular attention to prose and lyric poetry. The lyric poetry includes poems of all the important romantic poets, beginning with Holderlin, Tieck, Novalis, and extending through Morike. Among the prose works discussed are *Novellen* by Eichendorff, Tieck, Chamisso, Kleist, Fougue, Keller, Meyer, and Ludwig. Lectures (in German) and reports. *Prereq.* LNG 1232 or *equiv.*

LNG 1310 German Drama of the Nineteenth Century 4 QH

Dramas read are selected from Germany's foremost dramatists of the nineteenth century, including Kleist, Hebbel, Grillparzer, and Ludwig. Lectures (in German) and reports. *Prereq.* LNG 1232 or *equiv.*

LNG 1311 German Literature of the Twentieth Century 4 QH

Considers lyric poetry and prose works of important German writers of the twentieth century, including Schnitzler, Hauptmann, Mann, and Kafka. Lectures (in German) and reports. *Prereq.* LNG 1232 or *equiv.*

LNG 1312 German Drama of the Twentieth Century 4 QH

Plays are selected from those by important dramatists of the twentieth century, including Schnitzler, Hauptmann, Sudermann, Hofmannsthal, Wedekind, Kaiser, Toller, and Brecht. Lectures (in German) and reports. *Prereq.* LNG 1232 or *equiv.*

LNG 1315 The German Lyric 4 QH

The course offers a survey of the German lyric from the twelfth century to the present. Analysis and interpretation of representative selections from major lyric poets such as Walther von der Vogelweide,

Gerhard, Fleming, Gryphius, Klopstock, Claudius, Goethe, Schiller, Holderlin, Eichendorff, Brentano, Heine, Morike, Storm, Meyer, Rilke, and Brecht. Background of the development of the German lyric, movements, and types. Class discussions and reports. *Prereq.* LNG 1232 or *equiv.*

LNG 1316 The Dramatic Works of Franz Grillparzer 4 QH

The course includes reading, analysis, and interpretation of representative works of Franz Grillparzer, Austria's greatest dramatist: *Sappho*, *Des Meeres und der Liebe Wellen*, *Der Traum ein Leben*, *König Ottokars Gluck und Ende*, and the novella, *Der arme Spielmann*. Collateral readings, discussions, and reports. *Prereq.* LNG 1232 or *equiv.*

LNG 1801, LNG 1802, LNG 1803, LNG 1804, LNG 1805 Directed Studies 4 QH each

Directed studies offer students a way of going beyond work given in the regular curriculum and may also serve as a means to complete major or minor requirements in certain situations. Directed studies will not be given in areas adequately covered by existing courses. Priority is given to language majors and to juniors and seniors.

LNG 1820, LNG 1821, LNG 1822, LNG 1823 4 QH each Junior/Senior Honors Program

For details contact the Honors Office, 183 Holmes.

Italian

Prerequisites listed for modern languages are based on current course numbers at Northeastern. Equivalent course work done elsewhere will be considered acceptable to satisfy these prerequisites.

LNI 1101 Elementary Italian 1 4 QH

For the beginner who wants instruction in the essentials of Italian grammar and the opportunity to practice speaking and reading the language.

LNI 1102 Elementary Italian 2 4 QH

Continued study of grammar and basic language skills. Practice in more advanced conversation and reading. *Prereq.* LNI 1101 or *equiv.*

LNI 1103 Intermediate Italian 1 4 QH

Review of grammar. Progressively more intensive practice in oral and written communication. Reading will be from selected modern texts. *Prereq.* LNI 1102 or *equiv.*

LNI 1104 Intermediate Italian 2 4 QH

Review of grammatical difficulties, with attention given to current idiomatic forms. Greater emphasis on self-expression. Reading of short stories or a modern novel. *Prereq.* LNI 1103 or *equiv.*

LNI 1201 Italian Composition and Conversation 1 4 QH

For students who have mastered the fundamentals of the language. There will be no study of grammar as such. The course aims at helping students strengthen speaking and writing ability through an analysis of the language, oral and written reports, and general discussions on a variety of topics. Conducted entirely in Italian. *Prereq.* LNI 1104 or *equiv.*

LNI 1202 Italian Composition and Conversation 2 4 QH

Continuation of LNI 1201, with stress on individual work, free discussions, and compositions. Conducted entirely in Italian. *Prereq.* LNI 1201 or equiv.

LNI 1231 Masterpieces of Italian Literature 1 4 QH

Introductory course in Italian literature covering the *Trecento* to the seventeenth century. An analysis will be made of major trends and writers beginning with the *doice stil nuovo*, Dante's *Vita Nuova*, and continuing with readings from Petrarca's *Canzoniere*, Boccaccio's *Decameron*, and Machiavelli's *La Mandragola*. Discussion of the readings, oral and written reports. Conducted basically in Italian, but students are allowed to express themselves in English. *Prereq.* LNI 1104 or equiv.

LNI 1232 Masterpieces of Italian Literature 2 4 QH

Continuation of LNI 1231, but may be taken separately. This course concentrates on authors from the eighteenth to the twentieth centuries, such as Goldoni, Leopardi, Verga, Pirandello, Moravia, Levi, and Buzzati. A novel, a play, or poetry selections from each author will be discussed. Oral and written reports. Conducted in Italian, but students may use English. *Prereq.* LNI 1104 or equiv.

LNI 1311 Italian Literature of the Twentieth Century 1 4 QH

Reading and discussion of some of the novels, plays, and poems from a variety of literary trends and styles that evolved between the turn of the century and World War 2. Among the authors studied are Verga, Pascoli, D'Annunzio, Pirandello, Deledda, and Svevo. Oral and written reports. The course will be conducted in Italian, but students may use English. Offered in alternate years. *Prereq.* LNI 1232 or equiv.

LNI 1312 Italian Literature of the Twentieth Century 2 4 QH

The postwar period to the present. Many important authors have arisen since the early forties, and their books reflect the preoccupations, moods, and aspirations of our changing times. Among the writers considered in this course are Moravia, Silone, Vittorini, Pavese, Guareschi, Buzzati, Sciascia, Ungaretti, Montale, and Quasimodo. Oral and written reports are required. English may be used, but the course will be conducted in Italian. Offered in alternate years. *Prereq.* LNI 1232 or equiv.

LNI 1801, LNI 1802, LNI 1803, LNI 1804, LNI 1805 Directed Studies 4 QH each

Directed studies offer students a way of going beyond work given in the regular curriculum and may also serve as a means to complete major or minor requirements in certain situations. Directed studies will not be given in areas adequately covered by existing courses. Priority is given to language majors and to juniors and seniors.

LNI 1820, LNI 1821, LNI 1822, LNI 1823 Junior/Senior Honors Program 4 QH each

For details contact the Honors Office, 183 Holmes.

Russian

Prerequisites listed for modern languages are based on current course numbers at Northeastern. Equivalent coursework done elsewhere will be considered acceptable to satisfy these prerequisites.

LNR 1101 Elementary Russian 1 4 QH

The course includes essentials of grammar, practice in pronunciation, progressive acquisition of a basic vocabulary, idiomatic expressions.

LNR 1102 Elementary Russian 2 4 QH

Continuation of grammar study; oral and written exercises. *Prereq.* LNR 1101.

LNR 1103 Intermediate Russian 1 4 QH

Designed to help further the student's knowledge of Russian through oral and written work; the study of grammar and reading texts of moderate difficulty. *Prereq.* LNR 1102.

LNR 1104 Intermediate Russian 2 4 QH

Continuation of work and aims of LNR 1103. *Prereq.* LNR 1103.

LNR 1107 Scientific Russian 4 QH

The course offers readings of Russian texts in mathematics, physics, chemistry, astronomy, biology, and medical science. Designed to help prepare the student for the department reading examination in his or her chosen field. As far as possible, texts are selected on the basis of the students' needs and interests. *Prereq.* LNR 1104 or equiv.

LNR 1201 Russian Composition and Conversation 1 4 QH

Designed to assist students in developing skills in speaking and writing by means of detailed grammar review and extensive use of audio-visual media. Conducted in Russian. *Prereq.* LNR 1104 or equiv.

LNR 1202 Russian Composition and Conversation 2 4 QH

A continuation of LNR 1201 with an increased emphasis on speaking the colloquial Russian idiom. Conducted in Russian. *Prereq.* LNR 1201 or equiv.

LNR 1203 Advanced Russian Proficiency 1 4 QH

Emphasizes speaking and writing skills through the study of Russian word formation and derivation. Weekly compositions or oral reports are required. Conducted in Russian. *Prereq.* LNR 1202 or equiv.

LNR 1204 Advanced Russian Proficiency 2 4 QH

Emphasizes speaking and writing skills through the study and use of Russian idioms and colloquialisms. Conducted in Russian. *Prereq.* LNR 1203 or equiv.

LNR 1205 Stylistics and Advanced Grammar Analysis 1 4 QH

Designed for students pursuing a major or minor in the Russian language; focuses on modern usage of the Russian language through newspaper and magazine articles and short stories. *Prereq.* LNR 1104 or permission of instructor.

LNR 1206 Stylistics and Advanced Grammar Analysis 2 4 QH

Continues goals of LNR 1205 and also focuses on helping students improve listening comprehension

through the use of extensive lab work. *Prereq.* LNR 1205 or permission of instructor.

LNR 1309 Russian Short Stories of the Nineteenth Century 4 QH

Offers detailed analysis of selected representative short stories read in Russian; study of the development of this genre. *Prereq.* LNR 1104 or equiv.

LNR 1315 Russian Expository Prose 4 QH

Selected readings of lectures, speeches, essays, and critical studies by outstanding Russian scholars. *Prereq.* LNR 1104.

LNR 1316 Russian Folklore 4 QH

Various genres of Russian folk literature are read in Russian. Readings are supplemented with lectures and tape recordings. *Prereq.* LNR 1104.

LNR 1317 Russian Poetry 4 QH

Analyzes in Russian the major works of important classical and modern poets. *Prereq.* LNR 1104.

LNR 1801, LNR 1802, LNR 1803, LNR 1804, LNR 1805 Directed Studies 4 QH each

Directed studies offer students a way of going beyond work given in the regular curriculum and may also serve as a means to complete major or minor requirements in certain situations. Directed studies will not be given in areas adequately covered by existing courses. Priority is given to language majors and to juniors and seniors.

LNR 1820, LNR 1821, LNR 1822, LNR 1823 Junior/Senior Honors Program 4 QH each

For details contact the Honors Office, 183 Holmes.

Spanish

Prerequisites listed for modern languages are based on current course numbers at Northeastern. Equivalent coursework done elsewhere may be considered

LNS 1101 Elementary Spanish 1 4 QH

Presents essentials of correct usage through acquisition of basic skills in reading, writing, speaking, and aural comprehension.

LNS 1102 Elementary Spanish 2 4 QH

Continues language instruction with increasing attention to vocabulary and skills relevant to persons who wish to become involved with the Hispanic world. *Prereq.* LNS 1101 or equiv.

LNS 1103 Intermediate Spanish 1 4 QH

Includes completion of basic grammatical usage; reading of contemporary Hispanic plays; and oral and written communication based upon assigned readings. *Prereq.* LNS 1102 or equiv.

LNS 1104 Intermediate Spanish 2 4 QH

Offers intensive reading of current topics, conversation practice utilizing skills acquired in previous coursework, and composition practice based upon varied assigned topics. *Prereq.* LNS 1103 or equiv.

LNS 1105 Conversational Spanish 1 4 QH

Emphasizes developing the ability to speak and comprehend Spanish. Particularly able students may be accepted after having completed only LNS 1103. In

this case, LNS 1105 may be used to satisfy the language requirement. *Prereq.* LNS 1104 or equiv.; open to nonmajors only.

LNS 1106 Conversational Spanish 2 4 QH

Continues LNS 1105, with further emphasis on the development of oral facility in Spanish. Particularly able students may be accepted after having completed only LNS 1104. *Prereq.* LNS 1105 or equiv.; open to nonmajors only.

LNS 1130 Intensive Spanish 8 QH

This course encompasses the same material covered in LNS 1101 and LNS 1102. Students with language-learning ability and a commitment to the study of foreign languages are encouraged to take the course. Students are expected to assimilate the material at an accelerated pace. This is a two-sequence course; students must enroll in both sequences. Satisfactory completion of this course enables the student to take LNS 1103.

LNS 1201 Spanish Composition and Conversation 1 4 QH

Offers practice in writing and speaking Spanish, including written and oral resumes, prepared speeches and themes, and impromptu speaking and writing. Reviews the more subtle problems of grammar.

LNS 1202 Spanish Composition and Conversation 2 4 QH

Offers further practice in oral and written Spanish; continues study of advanced Spanish grammar. *Prereq.* LNS 1201 or equiv.

LNS 1203 Advanced Spanish Proficiency 1 4 QH

Designed for those preparing to enter the teaching profession as well as qualified advanced students. Covers advanced elements of Spanish syntax, with emphasis upon achieving superior speaking, reading, and writing skills. *Prereq.* Permission of instructor.

LNS 1204 Advanced Spanish Proficiency 2 4 QH

Continues the aims and goals of LNS 1203. *Prereq.* LNS 1203 and permission of instructor.

LNS 1231 Masterpieces of Spanish Literature 1 4 QH

Traces the development of Spanish literature from the Middle Ages (las jarchas, *El poema del Cid*, *El libro de buen amor*, *La Celestina*) through the Renaissance and Baroque periods or Golden Age (Garcilaso de la Vega, the picaresque novel, the mystics, Cervantes, Lope de Vega, Calderon). Conducted in Spanish. (II) *Prereq.* LNS 1104 or equiv.

LNS 1232 Masterpieces of Spanish Literature 2 4 QH

Continues LNS 1231. Surveys the literature of eighteenth-, nineteenth-, and twentieth-century Spain. Includes the literary movements of romanticism, realism, and the generation of '98. Conducted in Spanish. (II) *Prereq.* LNS 1104 or equiv.

LNS 1301 Spanish Literature of the Middle Ages 4 QH

Studies selections from the major works of the Middle Ages, from *El poema del Cid* to the *Libro de buen amor*. Conducted in Spanish. *Prereq.* LNS 1232 or equiv.

LNS 1303 Spanish Literature of the Fifteenth and Sixteenth Centuries 4 QH

Examines selections from the major works of the fifteenth and sixteenth centuries. Works considered include *La Celestina*, *Lazarillo de Tormes*, and *El Romancero*. Conducted in Spanish.

LNS 1305 Cervantes and His Times 4 QH

Examines selections from Cervantes' minor works (the *Entremeses* and the *Novelas ejemplares*); emphasis, however, is on *Don Quixote*, Spain's greatest literary masterpiece. Conducted in Spanish.

Prereq. LNS 1232 or equiv.

LNS 1306 Spanish Golden Age Theatre 4 QH

Examines plays by the outstanding dramatists of the seventeenth century: Lope de Vega, Calderon de la Barca, Tirso de Molina, Ruiz de Alarcon, and others. Conducted in Spanish. *Prereq.* LNS 1232 or equiv.

LNS 1309 Spanish Literature of the Nineteenth Century I 4 QH

Covers readings in the prose, poetry, and drama of the romantic period, including selections from el Duque de Rivas, Larra, Espronceda, Zorrilla, and Becquer. Conducted in Spanish. *Prereq.* LNS 1232 or equiv.

LNS 1310 Spanish Literature of the Nineteenth Century 2 4 QH

Offers a study of some of the major novelists of the second half of the nineteenth century, such as J. M. de Pereda, Juan Valera, Emilia Pardo Bazan, and B. Perez Galdos. Conducted in Spanish. *Prereq.* LNS 1232 or equiv.

LNS 1311 Spanish Literature of the Twentieth Century I 4 QH

Examines selections from the writings of the Generation of '98: Unamuno, Valle-Inclan, Pio Baroja, Benavente, Azorin, and the Machado brothers. *Prereq.* LNS 1232 or equiv.

LNS 1312 Spanish Literature of the Twentieth Century 2 4 QH

Focuses on prose and poetry of modern writers, such as Ortega y Gasset, Perez de Ayala, Garcia Lorca, Juan Ramon Jimenez, Gironella, and Jose Cela. *Prereq.* LNS 1232 or equiv.

LNS 1315 Latin American Literature 4 QH

Focuses on early Latin American literature: the literature of the colonial period and the early nineteenth century, based primarily on selections from an anthology. *Prereq.* LNS 1232 or equiv.

LNS 1316 Latin American Literature 4 QH

Focuses on modern Latin American literature; readings from nineteenth- and twentieth-century prose and poetry. *Prereq.* LNS 1232 or equiv.

LNS 1400 Spanish Seminar 4 QH

This course is designed primarily for majors who have progressed to the upper-level literature courses

in Spanish. However, nonmajors who show exceptional background may be admitted with the instructor's permission. The course focuses upon a narrowly defined theme (that is, a single author, a single work, or a single theme), which students are asked to explore in depth; students are expected to present a final paper based upon individual research.

LNS 1401 Seminar in Spanish Literature 4 QH

This is an upper-level literature course designed primarily for majors, although nonmajors who show exceptional background in Spanish may be admitted. Students are expected to read a selected group of Galdos's novels, and the class meetings will concentrate on a detailed discussion and analysis of the works read. There are collateral readings as well, and a final paper on a topic to be selected by the student.

Prereq. Permission of instructor.

LNS 1402 Seminar in the Contemporary Spanish Theatre 4 QH

In contrast to the bourgeois theatre of consumption in Spain, there exist a number of dramatists committed to revealing the tragic social and existential aspects of the human condition. Emphasis is placed on authors such as Vallejo, Sartre, the members of the *generacion realista*, and the "underground" playwrights. Classes are conducted in Spanish. Class participation as well as oral and written projects required. Alternates yearly with LNS 1401. *Prereq.* LNS 1232 or permission of instructor.

LNS 1801, LNS 1802, LNS 1803, LNS 1804, LNS 1805 Directed Studies 4 QH each

Offers students a way of going beyond work given in the regular curriculum; may also enable students to complete major or minor requirements in certain situations. Will not be given in areas adequately covered by existing courses. Priority given to language majors and to juniors and seniors.

LNS 1820, LNS 1821, LNS 1822, LNS 1823 Junior/Senior Honors Program 4 QH each

For details contact the Honors Office, 183 Holmes.

LNL 1235 Applied Linguistics 4 QH

Explores the process of language learning and the nature of this experience for infants and adults. Emphasizes the child's ability to master successfully the complex essentials of its first language by the age of five, and how the development of cognitive capacity and language-learning ability are related. Discusses the role of the parent and of the physical environment. Other topics include second-language learning, contrastive analysis, learning English as a second language or dialect, sign language, the significance of "errors," learning strategies, and a survey of language-teaching methods.

Mathematics

The mathematics department offers several sequences of courses that may overlap in content. Please consult the mathematics department if you have any questions regarding course content. You will not receive credit for two courses that overlap in content.

Numbers inside parentheses within course descriptions refer to core curriculum categories, listed on page 2.

MTH 1000 Mathematics Preliminaries 1

4 QH

Supplies, together with MTH 1010, the high school math background necessary for a student to enroll in MTH 1101, MTH 1106, or MTH 1113. Includes the arithmetic of signed numbers, fractions, decimals, and percents; algebraic manipulation and solution of simple equations; elementary word problems; and laws of exponents. *Prereq.* Permission of course coordinator.

MTH 1010 Mathematics Preliminaries 2

4 QH

Supplies, together with MTH 1000, the high school math background necessary for a student to survive in MTH 1101, MTH 1106, or MTH 1113. Includes quadratic equations and systems of equations; graphing (including slope of a line and vertex of a parabola), more word problems; logarithms, trigonometry, or some of both at the instructor's discretion. (In winter and spring quarters, the material covered in MTH 1000 is assumed; in the fall quarter, there is an overlap with MTH 1000 on solving equations, word problems, and laws of exponents.)

MTH 1101 Basic Algebraic Applications

4 QH

Examines systems of linear equations and their graphs. Focuses on graphing systems of linear inequalities in two variables with application to linear programming. Introduction to matrices, matrix multiplication, and vectors. (I) *Students do not receive credit for MTH 1101 if they have already received credit for MTH 1113.*

MTH 1103 Basic Probability

4 QH

Covers introduction to probability, sample spaces with equiprobable events, permutations and combinations, conditional probability. Also discusses random variables, introduction to Markov processes.

MTH 1106 Fundamentals of Mathematics

4 QH

Examines how to solve various kinds of algebraic equations: linear, quadratic, and linear systems in two and three unknowns. Considers applications to word problems such as motion, mixture, and variational problems. Covers the concept of function, graphs, line slopes, and graphs of polynomials. Also discusses some elementary trigonometry and vectors in the plane.

MTH 1107 Functions and Basic Calculus

4 QH

Introduces differential calculus. Examines elementary rules of differentiation with application to graph sketching and to maximum and minimum problems. Discusses exponential and logarithmic functions with applications to compound interest, population growth, and radioactive decay. (I) *Students do not receive credit for MTH 1107 if they have already received credit for MTH 1114.*

MTH 1108 Calculus

4 QH

Offers a review and continuation of differential calculus, graphing and differentiation of trigonometric functions; also presents an introduction to integral calculus with applications to geometric problems and differential equations.

MTH 1113 College Mathematics for Business

4 QH

Focuses on sets, rectangular coordinates and graphs, functions and functional notation, linear and quadratic functions, exponential and logarithmic functions, systems of linear equations, summations, inequalities, permutations and combinations, elementary probability concepts, arithmetic and geometric progressions, and simple and compound interest annuities. *Students do not receive credit for MTH 1113 if they have already received credit for MTH 1101.*

MTH 1114 Calculus for Business

4 QH

Focuses on matrices; Gaussian elimination inverses of matrices; systems of linear inequalities; feasible regions; graphical solution of linear programming problems; limits; derivatives; differentiation of polynomials and of exponential and logarithmic functions; maxima, minima, and points of inflection; optimization in nonlinear problems; and marginal analysis of cost revenue and profit functions. *Prereq.* MTH 1113 or equiv. *Students do not receive credit for MTH 1114 if they have already received credit for MTH 1107.*

MTH 1120, MTH 1121 Calculus

6 QH each

Assists students in overcoming deficiencies in precalculus mathematics without losing ground in the MTH 1123 sequence. Reviews high school algebra, introduces trigonometric functions, and covers the material in MTH 1123 and MTH 1124. Includes lecture and homework review sessions. (Students placed in this course by request or on the basis of their College Board scores and the results of an orientation-week diagnostic test.)

MTH 1123 Calculus 1

4 QH

Introduces the differential calculus of one variable, including trigonometric, exponential, and logarithmic functions, together with their graphs. Includes average rates of change, instantaneous rates of change, derivatives, and the chain rule. Covers curve sketching, applications of the derivative to problems involving related rates, and maxima and minima.

MTH 1124 Calculus 2

4 QH

Introduces integral calculus including areas, volumes, and other applications. Studies integration

involving trigonometric, inverse trigonometric, exponential, and logarithmic functions. Introduces differential equations. *Prereq.* MTH 1123.

MTH 1125 Calculus 3 **4 QH**

Studies the calculus of elementary functions in the context of complex numbers. Includes infinite series as well as second order differential equations. *Prereq.* MTH 1124.

MTH 1128 Calculus 3 **4 QH**

Examines further techniques of integration, graphs in two- and three-dimensions, double and triple integrals, and applications. *Prereq.* MTH 1124. *Only for students in the previous engineering curriculum.*

MTH 1133 Calculus for Biology Majors I **4 QH**

Presents an introduction to calculus with applications to biology, ecology, and medicine. Includes differentiation, curve sketching, anti-differentiation, and exponential functions.

MTH 1134 Calculus for Biology Majors 2 **4 QH**

Continues MTH 1133. Includes exponential growth and decay; integration and area; rules for differentiation; and functions of several variables, with LaGrange multipliers, total differentials, and the method of least squares. *Prereq.* MTH 1133.

MTH 1135 Calculus for Biology Majors 3 **4 QH**

Continues MTH 1134. Includes the natural logarithm; trigonometric functions; techniques of integration, including numerical methods and differential equations, with separation of variables and qualitative methods. *Prereq.* MTH 1134.

MTH 1137 Discrete Mathematics I **4 QH**

Examines proof methods: induction, case analysis, contradiction; binary, octal and hexadecimal numbers; modular arithmetic; sets, relations, equivalences, functions; combinations, permutations, elementary counting, and discrete probability; and elementary graph theory. *Prereq.* MTH 1123.

MTH 1143 Calculus 1 **4 QH**

Presents introductory calculus primarily for mathematics, physics, and chemistry majors. Together with MTH 1144 and MTH 1145, includes derivatives and integrals of one-variable functions; applications to curve sketching, maxima and minima problems, area, moments, simple volumes, etc.; approximation methods, including numerical integration, root finding, Taylor series, and power series. Requires students to master the use of the computer to make value tables and plot curves and to implement simple numerical algorithms.

MTH 1144 Calculus 2 **4 QH**

Continues MTH 1143. *Prereq.* MTH 1143.

MTH 1145 Calculus 3 **4 QH**

Continues MTH 1144. *Prereq.* MTH 1144.

MTH 1150 Probability, Statistics, and the Computer **4 QH**

Presents a computer-oriented introduction to statistical methods, with applications in the social and life sciences. Examines descriptive statistics, elementary probability, correlation and regression, and the fundamentals of statistical inference (confidence

intervals and hypothesis testing) with a minimum of mathematical derivations. Uses a statistical computer package such as MINITAB or SPSS to solve supplementary problems. (I) *Prereq.* Nonmath majors.

MTH 1152 Statistical Thinking **4 QH**

Introduces the statistical style of thinking for students without mathematical sophistication or who ordinarily don't like mathematics. Assigns readings will from a wide variety of sources. Uses extensive class discussion and homework problems (some on a computer) to teach students to use statistics and to critically evaluate the use of statistics by others. Covers descriptive statistics, statistical tests, confidence intervals, regression, and sampling. (II)

MTH 1160 Introduction to Computers I **4 QH**

Introduces computers and considers their applications; also introduces computer programming so that the uses and limitations of computers can be discussed intelligently. Presents small programs to be written and run. Considers applications such as sorting, searching, data processing, simulation, and artificial intelligence. *Prereq.* Nonmath majors.

MTH 1163 Introduction to Computers and Computation **4 QH**

Offers an introduction to problem solving with the use of computers. Expects students to design, write, debug, and test programs in BASIC programming language. Includes application of programming to a wide variety of problems, including statistical analysis of data, plotting, artificial intelligence, and text processing.

MTH 1172 Introduction to Computer Science **4 QH**

Deals with problem solving in the context of computing. Focuses on structured programming using PASCAL language. Stresses correctness, clarity, and reliability of programs. (II)

MTH 1183 Mainstreams of Mathematics **4 QH**

Traces the development of some key mathematical ideas, their historical context, and current applications. May include mathematical games and puzzles; number systems past and present; logic and computers; calculus and the rise of modern science, art, and symmetry; and cut-and-paste topology. Assumes no more than high school algebra and geometry. Encourages students with diverse backgrounds to rediscover mathematics through individual projects, supplemental readings, and classroom discussions.

MTH 1188 Problem Solving and Pre-Calculus I **6 QH**

Develops basic algebraic and problem-solving skills in students who indicate these needs and are enrolled in this course rather than the four-credit MTH 1191. Together with MTH 1189, prepares the student for calculus (MTH 1193). Includes writing equations and relating word problems to equations, plotting linear equations, word problems involving algebraic fractions, algebraic operations, radicals, inequalities, functional notation and the graphing of functions.

MTH 1189 Problem Solving and Pre-Calculus 2 6 QH

Continues MTH 1188. Includes functions and graphing, composite functions and inverse functions, logarithmic and exponential functions and equations, trigonometric functions and their graphs, solving trigonometric problems, trigonometric identities, and vectors in two-dimensions.

MTH 1191 College Algebra 4 QH

Focuses on fundamental algebraic operations, complex numbers, radicals and exponents, functions, linear and quadratic equations, irrational equations, inequalities, variation, and roots of polynomial equations. *Prereq.* Mathematics placement test or MTH 4082; *BET majors only.*

MTH 1192 Pre-Calculus 4 QH

Focuses on logarithms, trigonometric functions of angles in degrees and radians, trigonometric identities and equations, right triangles, oblique triangles, complex numbers in trigonometric form, systems of equations, and determinants. *Prereq.* MTH 1191 or MTH 4107; *BET majors only.*

MTH 1193 Calculus 1 4 QH

Focuses on plane analytic geometry; differentiation of algebraic functions; rate, motion, maximum and minimum problems; derivatives of higher order; curve sketching; basics in functions, limits, and continuity. (Not equivalent to MTH 1123.) *Prereq.* MTH 1192 or MTH 4108; *BET majors only.*

MTH 1194 Calculus 2 4 QH

Focuses on applications of derivatives to curve sketching; antidifferentiation; the definite integral, with applications; calculus of nonalgebraic functions — logarithmic, exponential, and trigonometric; calculus of inverse trigonometric functions; techniques of integration; indeterminate forms; and L'Hopital's rule. (Not equivalent to MTH 1124.) *Prereq.* MTH 1193 or MTH 4120; *BET majors only.*

MTH 1195 Calculus 3 4 QH

Focuses on polar coordinates, vectors in a plane, calculus of functions of several variables, partial differentiation, multiple integrals, infinite series, vector analysis, and introduction to differential equations. (Not equivalent to MTH 1125.) *Prereq.* MTH 1194 or MTH 4121; *BET majors only.*

MTH 1196 Differential Equations 4 QH

Focuses on ordinary differential equations — standard types of the first order, linear differential equations, especially with constant coefficients; Laplace transforms; series solutions of differential equations; and Fourier series and orthogonal functions. *Prereq.* MTH 1195.

MTH 1203 History of Mathematics 4 QH

Focuses on development of the various branches of mathematics, lives of outstanding mathematicians, growth of mathematical knowledge and its relation to culture. (III)

MTH 1212 Linear Programming 4 QH

Presents an introduction to concepts and techniques of linear programming, game theory, discrete modeling (shortest path, minimum spanning tree). Explores application to economics, social sciences,

and other related fields. (II) *Prereq.* One year of college mathematics.

MTH 1223 Calculus 4 4 QH

Covers partial derivatives and multiple integrals, with applications. *Prereq.* MTH 1125.

MTH 1225 Mathematical Analysis 1 4 QH

Offers a study of ordinary differential equations for engineering students. *Prereq.* MTH 1223 or equivalent.

MTH 1226 Mathematical Analysis 4 QH

Focuses on numerical methods for solving ordinary differential equations, Fourier series, and selected partial differential equations by separation of variables. (Intended primarily for engineering students.) *Prereq.* MTH 1225.

MTH 1227 Calculus 4 4 QH

Focuses on solid analytical geometric, vector methods, parametrized curves, surfaces, partial differential with applications, and notions of linear algebra. *Only for students in the previous engineering curriculum.*

MTH 1228 Calculus 5 4 QH

Focuses on infinite series, Taylor series, convergence of power series, Fourier series, approximation methods, and various numerical techniques. *Only for students in the previous engineering curriculum.*

MTH 1233 Mathematical Models in the Life Sciences 4 QH

Focuses on the derivation and solution of mathematical models in biology, psychology, and the social sciences. May include such topics as population dynamics, diffusion processes, pollution control systems, neural networks, and mathematical genetics. *Prereq.* One year of calculus.

MTH 1237 Discrete Mathematics 2 4 QH

Covers elementary number and group theory. Examines fields, finite fields, coding theory, Hamming and BCH codes, counting arguments. *Prereq.* MTH 1137 and MTH 1223.

MTH 1238 Combinatorial Mathematics 4 QH

Provides a transition from calculus to more traditional mathematics courses. Explores various techniques for counting, such as permutations, combinations, inclusion-exclusion, Polya enumeration, and the mathematical formulations necessary for these techniques, including elementary group theory and equivalence relations. *Prereq.* Two courses in calculus.

MTH 1243 Calculus and Linear Methods 1 4 QH

Focuses on methods of calculus and vector analysis to study curves, surfaces, and functions of several variables. Studies parameterization of lines and planes, tangents and normal vectors, partial derivatives, maxima and minima problems, linear approximations, and tangent planes. Some linear algebra. *Prereq.* MTH 1145.

MTH 1244 Calculus and Linear Methods 2 4 QH

Continues MTH 1243. Covers multiple integration, line integrals, and exact differentials; various forms of Stoke's theorem; and more linear algebra. *Prereq.* MTH 1243.

MTH 1245 Differential Equations and Linear Methods 1 **4 QH**

Focuses on ordinary differential equations and linear algebra. Examines first-order equations, higher-order (primarily second-order) linear differential equations, systems of linear differential equations. Studies linear algebra, which includes eigenvalues and eigenvectors primarily for two-dimensional systems. Discusses applications of ordinary differential equations. *Prereq.* MTH 1145.

MTH 1246 Differential Equations and Linear Methods 2 **4 QH**

Focuses on analysis of linear partial differential equations (wave equations, heat equation, and potential equation). Covers ordinary differential equations with boundary values, Fourier analysis, and orthogonal functions. Also considers numerical methods and other topics in ordinary differential equations. *Prereq.* MTH 1245.

MTH 1301 Linear Algebra 1 **4 QH**

Focuses on vectors and vector spaces, including function spaces, subspaces. Examines lengths, angles, scalar products; volumes, determinants; linear independence and dependence, dimension, linear and affine maps, kernel and image. Studies algorithms: row operations, double triangular form, inversion. Introduces linear maps. Gives particular attention to characteristic polynomials, eigenvalues, and eigenvectors in low dimensions. *Prereq.* MTH 1244 or equiv. *Students who have not completed MTH 1143 through MTH 1246 should inform the course instructor.*

MTH 1302 Linear Algebra 2 **4 QH**

Focuses on detailed study of linear maps. Studies symmetric maps and quadratic forms, isometries, skew-symmetric maps; decomposition of general linear maps using symmetric maps and isometries. Covers polynomials evaluated on linear maps, generalized eigenspaces, Jordan form. As time permits, introduces computational methods, with emphasis both on geometry underlying algorithms and on practical advantages and limitations. Surveys related areas in mathematics in which linear ideas play a role. *Prereq.* MTH 1301. *Upper-level students who have not completed MTH 1243 through MTH 1246 may take MTH 1301 and MTH 1302. Such students should inform the course instructor.*

MTH 1311 Analysis 1 **4 QH**

Examines the theoretical foundations of calculus: limits, measure, continuity, and related concepts. With MTH 1312 serves as a bridge between the MTH 1243 through MTH 1246 calculus sequence and the more advanced analysis courses, such as MTH 1347, MTH 1348, MTH 1351, MTH 1370, and MTH 1371. *Prereq.* MTH 1246 or permission of instructor.

MTH 1312 Analysis 2 **4 QH**
Continues MTH 1311. Focuses on calculus, applying the concepts introduced in MTH 1311. *Prereq.* MTH 1311.

MTH 1321 Introduction to Groups and Their Applications **4 QH**

Presents examples of groups (symmetry groups, permutation groups, matrix groups, cyclic groups) and their subgroups. Studies finite groups and orders of subgroups; homomorphisms and normal subgroups. Also considers applications to some of the following, depending on time and interest: geometry, number theory, crystallography, physics, and combinatorics.

MTH 1322 Topics in Rings, Fields, and Number Theory **4 QH**

Focuses on algebraic properties of the integers and rational, real, and complex numbers. Also covers commutative rings, ideals, integral domains, and other quotient fields; polynomial rings; quadratic extension fields; Gaussian integers; and other topics as time permits. *Prereq.* MTH 1321.

MTH 1327 Optimization and Mathematical Game Theory **4 QH**

Focuses on convex sets in Euclidean n -space, linear and nonlinear programming, zero-sum games, dynamic programming. Encourages students to program selected solution methods for a computer. *Prereq.* Some linear algebra, for example, MTH 1301, or permission of instructor.

MTH 1330 Number Theory **4 QH**

Introduces the elementary methods of analytic number theory. Focuses on divisibility, congruences, arithmetical and multiplicative functions, quadratic reciprocity, and equivalent formulations of the prime number theorem. *Prereq.* MTH 1301 or permission of instructor.

MTH 1337 Foundations of Mathematics **4 QH**

Studies the following topics and the shifts in perspective that their development brought about: the disputes over the basis for calculus, twentieth-century discoveries in mathematical logic, and the advent of the computer. (V)

MTH 1338 Foundations of Mathematics **4 QH**

Includes set theory, rules for set formation, the axiom of choice and its role in mathematics, transfinite cardinal and ordinal numbers and arithmetic, and axiomatizations of set theory.

MTH 1347 Applied Analysis **4 QH**

Demonstrates the application of mathematics to interesting physical and biological problems. Examines methods chosen from ordinary and partial differential equations, calculus of variations, Laplace transforms, singular perturbations, special functions, dimensional analysis, and other techniques of applied mathematics. *Prereq.* MTH 1246 or permission of instructor.

MTH 1348 Applied Analysis **4 QH**

Continues MTH 1347. *Prereq.* MTH 1347.

MTH 1349 Numerical Analysis 1 **4 QH**

In practice, computations are never exact. Therefore, the problem of finding efficient methods to calculate sufficiently accurate answers is of fundamental importance. The emphasis of the course is not on recipes for solving problems, proving theorems, or

on writing computer programs. Rather, the practical concerns of efficiency and accuracy are illustrated by studying the following problems: roots of a non-linear equation, simultaneous linear equations, interpolation, and curve-fitting. *Prereq.* Two years of calculus and one course in programming.

MTH 1350 Numerical Analysis 2 4 QH

Analyzes problems in differential equations, integration, and ordinary differential equations. (Does not require prior knowledge of differential equations; MTH 1349 is not a prerequisite.) Emphasis is similar to that of MTH 1349. *Prereq.* Two years of calculus and one course in programming.

MTH 1351 Functions of a Complex Variable 1 4 QH

Focuses on algebra and geometry of complex numbers; concepts of limit, continuity, and derivative in the complex domain; holomorphic functions, series, contour integration; and applications. *Prereq.* MTH 1243 or equiv.

MTH 1352 Functions of a Complex Variable 2 4 QH

Continues MTH 1351. May include conformal mapping, analytic continuation, Riemann surfaces, the Laplace transform and inverse transform, elliptic functions, and applications. *Prereq.* MTH 1351.

MTH 1367 Geometry 4 QH

Provides a careful look at classical Euclidean geometry, Hilbert's axioms for geometry, and an extensive study of the basics of projective geometry. *Prereq.* Some basic linear algebra or permission of instructor.

MTH 1370 Recent Ideas in Geometry 4 QH

Presents some non-Euclidean geometry, especially hyperbolic and elliptic geometries. Topics include algebraic curves and surfaces. *Prereq.* MTH 1367 or permission of instructor.

MTH 1371 Recent Ideas in Geometry 4 QH

Continues MTH 1370. *Prereq.* MTH 1370.

MTH 1384 Probability for Engineering 4 QH

Discusses sample spaces; axioms of probability; random variables and their distributions; expectation, moments, and characteristic function; bivariate distributions; jointly Gaussian random variables; stochastic processes, including autocorrelation function and power spectral density; and estimation of the mean and autocorrelation function in the presence of noise. *Prereq.* MTH 1223 and MTH 1225 or equiv.

MTH 1387 Probability 1 4 QH

Focuses on probability functions for finite and infinite spaces; conditional probability and independence; discrete and continuous probability distributions for one or more random variables;

expectation; moments; binomial, Poisson, and normal distributions; and central limit theorem. *Prereq.* MTH 1223 or MTH 1244.

MTH 1388 Probability 2 4 QH

Studies selected topics, including introduction to stochastic processes, with emphasis on Poisson processes and Markov chains. *Prereq.* MTH 1384 or MTH 1387.

MTH 1390 Mathematical Statistics 4 QH

Focuses on estimation of parameters, confidence intervals, hypothesis testing, regression, sampling distributions. Introduces analysis of variance and statistical decision theory. *Prereq.* MTH 1384 or MTH 1387.

MTH 1392 Multivariate Statistics 4 QH

Examines methods of classification, estimation, and prediction based on several statistical variables. *Prereq.* MTH 1390.

MTH 1714, MTH 1723, MTH 1724, MTH 1725, MTH 1733, MTH 1734, MTH 1735, MTH 1743, MTH 1744, MTH 1745, and MTH 1746 Honors Program 4 QH each

Special sections for honors students of courses MTH 1114, MTH 1123, MTH 1124, MTH 1125, MTH 1133, MTH 1134, MTH 1135, MTH 1143, MTH 1144, MTH 1145, and MTH 1243 respectively.

MTH 1763 Introduction to Computers (Honors) 4 QH

Honors equivalent of MTH 1163.

MTH 1801–MTH 1808 Directed Study 4 QH

Gives highly motivated students the opportunity to explore mathematical situations and theories in depth. Can be used as an opportunity to examine familiar material in fresh ways or to explore new material not offered in formal courses. Provides students strong in mathematics and the related sciences a chance to develop the art and skill needed to work independently and creatively in mathematics. *Prereq.* Permission of instructor. Students strong in mathematics are permitted to enroll in graduate mathematics courses.

MTH 1809 Directed Study: Problem Solving 4 QH

Emphasizes mathematical problem-solving techniques from a range of areas, including but not limited to integration, differentiation, number theory, group theory, field theory, combinatorics, linear algebra, differential equations, and mathematical modeling. The mathematical model aspect constitutes one third to one half of the course. Analyzes specific real-world models in complete detail, including running and analyzing computer simulations. Requires students to make a number of presentations to the class demonstrating specific techniques. *Prereq.* Permission of instructor.

Music

Some courses in the College of Arts and Sciences are duplicated in different departments or colleges or within a department. You may not receive credit for two such courses. If you have a question about whether one course overlaps another, please consult the departments involved and the Office of the Dean before you take the course.

Numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 2.

MUS 1100 Introduction to Music

4 QH

Offers an introduction to selected works of our Western musical heritage, from earliest to contemporary styles. Consists primarily of a survey and listening format, with emphasis on styles, basic theory, forms, and the historical, social, and artistic periods that these works represent. (II)

MUS 1101 Music as a Listening Experience

4 QH

This introductory course is listening-oriented and has been designed to provide tools for the aural appreciation of musical forms. No previous musical knowledge is required or assumed, and studies deal directly with compositions selected from the masterpieces of music. Organized according to the tenets of PSI (Personalized System of Instruction), the course allows students to proceed at their own pace under the constant guidance and supervision of the instructor. Grades are determined by the number of units completed. Students are expected to meet with the instructor before the beginning of the course. (II)

MUS 1102 Music in Concert

4 QH

Gives students the opportunity to develop musical understanding through the study of music currently performed in concerts by major symphony orchestras in the United States and throughout the world. Selects study materials from symphony concert programs.

MUS 1103 Music as a Social Expression

4 QH

Examines the processes of music-making and the perceptions of music's functions in our culture. Considers how music is made, what music means, what kind of music is made, and what music is made to be meaningful. Identifies styles and genres of music and examines them within an ever-shifting context of aesthetics, social history, and cultural change. (III)

MUS 1104 Survey of African-American Musics

4 QH

Explores the various musical traditions of African-Americans, with a specific focus on the United States. Examines the impact of African, European, and Native American traditions on African-American music as well as the role of music as an expression of African-American aesthetics, traditions, and life. Considers historical and contemporary forms of African-American musics, with selected video presentations of musical styles.

MUS 1105 Music of the U.S.A.

4 QH

Examines American music from the time of Puritan psalm singing to the present. Covers a wide variety of music, including concert music, traditional folk music, jazz, and contemporary styles. (V)

MUS 1106 Women in Music

4 QH

Examines the multi-faceted role of women in music from the Renaissance through to the present. Discusses the fact that for centuries women have been active and influential patrons, composers, teachers, conductors, and performers in Europe and America. Examines their contributions to classical and popular music and to jazz, with emphasis on such widely varying figures as Elizabeth Jacquet de la Guerre, Fanny Mendelssohn Hensel, Clara Schumann, Amy Beach, Germaine Tailleferre, Billie Holiday, Carla Bley, Ruth Crawford Seeger, Pauline Oliveros, Sarah Caldwell, Antonia Brico, and Nadia Boulanger.

MUS 1107 Principles of Music Literature

4 QH

Examines the evolution of each major structural element of music through a historical perspective. Also, attempts to link larger categories of music such as classical, popular, and non-Western by examining their common elements. Required of all music majors. *Prereq. Permission of instructor.*

MUS 1109 Introduction to Music and the Arts

4 QH

Offers an interdisciplinary approach to music and other arts including painting, film, and theater. Examines works of art from various periods in the context of the cultures that produced them. Supplements regular classes with visits to art museums or attendance at concerts and theatrical performances. (II)

MUS 1110 Music in Popular Culture

4 QH

Deals with the nature of music composed for the mass market. Discusses techniques of recording and merchandising music and selected songs analyzes for their musical content. Traces the evolution of various styles, including ragtime, jazz, blues, rock, and music for the media.

MUS 1111 Rock Music

4 QH

Examines the development of rock'n'roll and its relationship to blues, rhythm and blues, country, folk, and other styles of music. Considers themes such as the role of rock as youth music, the reflections of social realities in rock songs, the relationship of rock to the recording industry and the mass media, and the changing styles of rock. Emphasizes listening skills.

MUS 1112 Jazz

4 QH

Examines the historical development of jazz music from its African-American roots to its current status as one of America's classical musics and an internationally valued art form. Devotes attention to the contributions of African musical traditions, including spirituals, work songs, and the blues. Examines

the impact of major contributors such as Eubie Blake, Ma Rainey, Louis Armstrong, Duke Ellington, Charles Parker, Miles Davis, John Coltrane, and Wynton Marsalis. Examines the functional role of jazz as a means of expression in African-American culture.

MUS 1120 Topics in Music History 4 QH

Provides a chronological view of Western music, while examining the role of music in society and exploring the contributions of influential composers. Discusses representative works from each period, including music by composers such as Machaut, Josquin, Bach, Handel, Mozart, Haydn, Beethoven, Berlioz, Wagner, Mahler, and Stravinsky. (III) *Prereq.* MUS 1201.

MUS 1121 Medieval and Renaissance Music 4 QH

Offers an introduction to European music from the sixth through the sixteenth centuries. Covers a wide variety of music, ranging from the serene elegance of sacred Gregorian chant and the plaintive love songs of the medieval troubadours to the lively dances and humanistic vocal music of the Renaissance. Examines representative works by composers such as Machaut, Landini, Josquin, Palestrina, and Dowland.

MUS 1122 Music of the Baroque Era 4 QH

Focuses on music of the seventeenth and early eighteenth centuries in Italy, Germany, France, and England. Discusses the emergence of important new genres (such as opera, sonata, and concerto) and examines representative works of major composers (such as Bach, Handel, Corelli, Vivaldi, Rameau, and Purcell).

MUS 1123 Music of the Classical Era 4 QH

Focuses on crucial developments in musical styles and forms of the late eighteenth century and on emerging genres, such as the symphony, the concerto, and the string quartet. Emphasizes the vocal and instrumental works of Haydn and Mozart and on the early works of Beethoven.

MUS 1124 Music of the Romantic Era 4 QH

Focuses on romantic realism and idealism as expressed in the music of the nineteenth century. Emphasizes historical, nationalistic, and literary influences. Includes composers such as Beethoven, Schumann, Schubert, Berlioz, Liszt, Verdi, Wagner, Brahms, Tchaikovsky, and Mahler. (V)

MUS 1125 Twentieth-Century Music 4 QH

Focuses on developments in music from 1900 to the present. Examines a broad range of musical styles, including expressionism, neo-classicism, and other major trends in music of the twentieth century. (V)

MUS 1126 New Directions in Music 4 QH

Recognizes that music from 1950 to the present has changed more radically than during any other era in history. Examines new elements in classical and popular music and focuses on the relationship between the two styles.

MUS 1130 The Symphony 4 QH

Studies the symphony as a major genre in the classical, romantic, and contemporary periods. Includes works by composers such as Haydn, Mozart,

Beethoven, Schumann, Tchaikovsky, Brahms, Sibelius, and Prokofiev.

MUS 1131 Piano Music: The Great Composers and Performers 4 QH

Gives students the opportunity to hear and analyze some of the greatest works for piano, performed by some of the world's greatest performers. In addition to recordings by internationally acclaimed artists, presents live performances by guest artists from the Boston area.

MUS 1132 Introduction to Opera 4 QH

Offers an analysis of opera as a dramatic genre. Isolates and discusses aria, recitative, ensemble, and other basic elements of opera. Considers number opera, music drama, and Singspiel types of opera. Includes composers such as Mozart, Wagner, Verdi, and Puccini.

MUS 1133 Great Choral Literature 4 QH

Analyzes sacred and secular choral literature from medieval to contemporary times.

MUS 1134 Music and Poetry 4 QH

Examines the art of setting words to music. Confronts the aesthetic problems encountered in a synthesis of two different art forms. Examines that synthesis in selected songs, choral works, tone poems, and operas of diverse periods and styles (classical, folk, and popular). (III)

MUS 1135 Traditional Folk Music of the United States 4 QH

Focuses on the major folk music traditions of North America and their origins in Europe and Africa. Emphasizes related ethnic dances, epics, and rituals.

MUS 1139 Film Music 4 QH

Surveys the use of music in film and video and gives an overview of the mechanics of synchronization and the psychological implications of applying music to film. Analyzes specific dramatic situations, followed by discussion of such scoring techniques as click tracks and picture recording. Studies films such as *The Informer*, *Alexander Nevsky*, *Citizen Kane*, *Forbidden Planet*, *Woman in the Dunes*, and *Tron*. Discusses the works and careers of specific film composers such as David Raskin, Aaron Copland, Jerry Goldsmith, Sergei Prokofiev, and John Williams.

MUS 1140 Mozart 4 QH

Traces Mozart's musical development from child prodigy to mature artist through personal letters and biographies. Analyzes many of his major compositions, including symphonies, concertos, operas, and chamber works.

MUS 1142 Stravinsky 4 QH

Focuses on the life and works of Igor Stravinsky, the man who has been perhaps the most influential of all twentieth-century composers. Selects important works (such as *The Rite of Spring*, *Symphony of Psalms*, *The Rake's Progress*, and *Agon*) from each of his major stylistic periods and assesses his contributions to twentieth-century musical style.

MUS 1144 Debussy and the Music of Paris 4 QH

Recognizes that Claude Debussy, impressionist in sound, composed music that marked a turning point toward modern trends. Covers much of his music for piano, orchestra, and voice, including *Suite Pour le Piano*, *Suite Bergamasque*, *Images* (for piano and orchestra), *Nocturnes*, *La Mer*, and *Pelleas et Melisande*. Discusses the music of Satie, Ravel, and Faure as it relates to that of Debussy.

MUS 1145 Beethoven 4 QH

Analyzes the complex personality and art of Beethoven, his relation to the turbulent times in which he lived, and his role in classical and romantic music. (III)

MUS 1146 George Gershwin 4 QH

Studies the life and works of George Gershwin (1898–1937), including popular song, musical comedy, opera, and orchestral compositions. Explores the relationship of George Gershwin to his times, both musically and historically. Takes as a critical starting point Gershwin's famous statement, "My people are American; my time is today."

MUS 1161 Music Therapy 1 4 QH

Examines the application of music as a therapeutic vehicle to release suppressed emotions, to encourage self-expression in psychiatric patients, and to treat a wide variety of disorders. Examines music therapy, in a modern approach to health services, as a supplement to other treatments.

MUS 1162 Music Therapy 2 4 QH

Examines the etiologies, characteristics, and applications of music therapy with the physically handicapped, hearing impaired, visually impaired, learning disabled, emotionally disturbed, speech/language impaired, and geriatric populations in one-to-one and group settings. In addition, studies improvisations and appropriate music materials for the nonmusician and adapted instrument designs tailored to each disability, while exploring the correlation of music and movement. Compares various musical therapy approaches; includes field trips to musical therapy sites in and around Boston. *Prereq.* MUS 1161.

MUS 1163 Sound Health 4 QH

Gives both musicians and non-musicians the opportunity to experience a heightened awareness of the power of music to effect physical and emotional change. Examines the effects of music on the body, mind, and spirit. Begins with an exploration into the awareness of sound and the physiological changes in the body caused by music, and moves through a variety of theories and techniques used to facilitate positive change, relaxation, and reduction of stress. Also considers sound pollution, the effects of vibrations on the body, guided imagery, music and meditation, and new-age environmental music.

MUS 1165 The Music Industry 1 4 QH

Examines business-related areas of the music industry. Includes topics such as the make-up and structure of the record industry and music publishing

world, the function of performing rights organizations (ASCAP and BMI), and the role of concert and orchestral managers. Includes guests from the various fields who will be invited to lecture in class and trips to "behind the scenes" locations.

MUS 1166 The Music Industry 2 4 QH

Continues MUS 1165. Covers such topics as artist management, theatrical production, concert promotion, and royalties and contracts. Requires students to undertake case studies of local musical organizations, both on and off campus.

MUS 1167 Music Management 4 QH

Introduces music management, including the structure of nonprofit organizations (such as arts service organizations, arts centers, symphony orchestras, chamber orchestras, ensembles, opera companies, and university arts programs) and the structure of profit enterprises. Examines financial management, funding, and audience development.

MUS 1170 Music and Technology 4 QH

Studies the applications of contemporary technology to music. Discusses basic acoustics, analog and digital recording techniques, computer sound synthesis, and the aesthetics of electronic music. Requires no prerequisites in physics or music theory; however, takes into consideration the particular backgrounds of individual students for projects and papers.

MUS 1172 Introduction to Music Recording 4 QH

Introduces the history and practice of recording music. Covers recording apparatus; microphones; monophonic, stereophonic, and digital theory and techniques; field recording; studio terminology; basic sound theory; and development of rudimentary editing skills. Also examines the role of the producer versus that of the technician, preparation for recording sessions, and basic legal regulations regarding copyrights and compensation.

MUS 1180 Introduction to World Music 4 QH

Introduces musical traditions from around the world using ethnomusicological approaches to examine the role of music in culture. Focuses on various world musics from the perspectives of the people who create the music and compares these perspectives with our own.

MUS 1181 Musics of Africa 4 QH

The musics of Africa are as varied as that continent's many linguistic and cultural groups. The course surveys various African musical traditions with respect to their historical, social, and cultural heritage. The course examines traditional and contemporary African musics, instruments, and performance traditions.

MUS 1182 Music of the Middle East 4 QH

Presents an introduction to the music of selected Near Eastern and Arab cultures (such as Persian in the East and Ethiopic and Berber in Africa). Includes the cantillation styles and practices of various chants of the Hebrew, Christian, and Islamic traditions.

MUS 1183 Music of East Asia**4 QH**

Introduces the student to the musical heritage of East Asia by examining music history, the relationship of music cultures to each other, the organization of musical sounds, and music as an aspect of culture. Emphasizes development of basic listening skills.

MUS 1184 Music of Latin America and the Caribbean**4 QH**

Examines the highly diverse and unique musical practices of Latin America and the Caribbean. Emphasizes music's role as an adjunct to religious and social practices, as well as how it has been influenced by European, Native American, and African music.

MUS 1200 Learning to Read and Write Music**4 QH**

Provides basic instruction for those who want to learn how to read music or how to write a tune. Gives students the opportunity to learn to sight-read music and to compose in some of the basic forms (song, theme and variation, etc.). Credit given for either MUS 1200 or MUS 1201, but not both because they include overlapping material.

MUS 1201 Fundamentals—Music Theory I**4 QH**

Offers the student the opportunity to learn simple melodic and rhythmic dictation skills; to recognize and build scales, intervals, and triads; and to sing at sight simple tonal melodies. Requires a noncredit, ear-training lab. (II)

MUS 1202 Music Theory 2**4 QH**

Focuses on harmonic practices in tonal music. Examines the role and function of harmony through analysis of musical examples and composition of four-voice chorales. Requires a noncredit, ear-training lab. *Prereq.* MUS 1201.

MUS 1203 Music Theory 3**4 QH**

Continues MUS 1202 and focuses on aspects of chromatic harmony. Discusses the construction and function of borrowed chords, altered chords, and non-diatonic harmony. Requires a noncredit, ear-training lab. *Prereq.* MUS 1202.

MUS 1204 Music Theory 4**4 QH**

Introduces the student to methods of musical analysis. Examines phrasing, periodicity, tension-repose, and other structural factors of musical compositions. Requires a noncredit, ear-training lab. *Prereq.* MUS 1203.

MUS 1209 Functional Piano**4 QH**

Gives students the opportunity to develop the keyboard skills appropriate for an undergraduate concentration in music. Studies realization of a figured bass, the harmonization of a melodic line, simple score reading (including treble, bass, alto, and tenor clefs), transposition, sight-reading, and the ability to play any of the major or minor scales. *Prereq.* MUS 1202.

MUS 1210 Music Theory Lab**1 QH**

Provides both group and individual instruction in ear training, sight-singing, and keyboard skills. This lab can be taken only in conjunction with the department's music theory courses (MUS 1201, MUS 1203, MUS 1204). May be repeated for credit.

MUS 1211 Sight-singing**4 QH**

Offers students the opportunity to learn how to read music at sight without the aid of a musical instrument, an essential skill for every musician. Emphasizes mastery of the skills of rhythm reading, as well as *solfège* and triad recognition in all diatonic keys, through class instruction and daily practice. Requires knowledge of the fundamentals of musical notation. *Prereq.* MUS 1201 or equivalent.

MUS 1230 Chorus**1 QH**

Allows students to participate as performers in one or more ensembles under the direction of a faculty conductor. May be repeated for credit. *Prereq.* *Permission of instructor.*

MUS 1231 Band**1 QH**

Allows students to participate as performers in one or more ensembles under the direction of a faculty conductor. May be repeated for credit. *Prereq.* *Permission of instructor.*

MUS 1232 Chamber Ensembles and Orchestra**1 QH**

Allows students to participate as performers in one or more ensembles under the direction of a faculty conductor. May be repeated for credit. *Prereq.* *Permission of instructor.*

MUS 1233 Early Music Players**1 QH**

Allows students to participate as performers in one or more ensembles under the direction of a faculty coach. May be repeated for credit. *Prereq.* *Permission of instructor.*

MUS 1240 Historical Instruments Workshop**4 QH**

Provides instruction for those who wish to learn to play a medieval, Renaissance, or baroque instrument. In addition to teaching basic skills on instruments such as recorder, flute, crumhorn, viola da gamba, vielle, cornetto, and harpsichord, provides opportunities for developing proficiency in music reading and ensemble playing.

MUS 1241 Piano Class I**4 QH**

Provides introductory-level study of piano designed for students with or without previous experience. Combines skills in reading music with improvisation and functional piano. Introduces some basic theory to help clarify the structure of class repertoire. Allows students to progress at their own pace. Determines grades by the amount of repertoire mastered during the quarter.

MUS 1242 Piano Class 2**4 QH**

Continues the skills developed in MUS 1241, with emphasis on increasing students' flexibility at the keyboard through the study of scales, transposition, and modulation. *Prereq.* MUS 1241.

MUS 1244 Voice Class I**4 QH**

Gives students the opportunity to learn the basic vocal production required for fine singing. Chooses repertoire, both classical and contemporary, for each student to learn and perform in lessons and before the entire class. Covers the following subjects: diction, the physiology of singing, resonance, registers, and interpretation. Also studies the basics of music

reading and sight-singing. Discusses some interpretation and plays recordings of the greatest vocal artists for class analysis. *Prereq.* *Permission of instructor.*

MUS 1247 Guitar Class 1 **4 QH**

Provides an introduction to the fundamentals of classical guitar playing for those with or without prior knowledge of the guitar. Covers music reading and theory. Requires students to perform alone and in ensemble with other members of the class. Augments the syllabus by live performances from outside professional and student classical guitarists. Bases final grades on several written examinations and student performance.

MUS 1250 Conducting **4 QH**

Provides instruction in the basic gestures used in conducting vocal and instrumental ensembles. Topics include beat patterns, conveying phrasing and articulation, cueing, controlling tempo and dynamics, score study, and rehearsal techniques. Provides an opportunity for students enrolled in the course to constitute a laboratory ensemble for regular practicum. *Prereq.* *Ability to read music and to sing or play an instrument.*

MUS 1261 Music Lessons **1 QH**

Offers private instruction in voice or in an instrument. Arranges lessons on a half-hour or 45-minute basis. Contact the music department for arrangements. Lab fee.

MUS 1265 Jazz Improvisation 1 **4 QH**

Focuses on repertory as well as performance. Examines the great improvisational artists in American music, such as Charlie Parker, Miles Davis, and John Coltrane. Approaches analysis from a theoretical as well as a practical perspective. Explores the use of rhythm, chords, scales, and modes in the creative improvisation process.

MUS 1301 Form and Analysis 1 **4 QH**

Examines representative examples of structural principles governing the melodic, harmonic, rhythmic, and formal components of music. Focuses on music from the sixteenth to the mid-nineteenth centuries. *Prereq.* *MUS 1204.*

MUS 1302 Form and Analysis 2 **4 QH**

Continues MUS 1301. Examines works from the late nineteenth century to the present. Includes selected readings by prominent twentieth-century theorists. *Prereq.* *MUS 1301.*

MUS 1461 Applied Music Lessons **3 QH**

Provides advanced individual instruction in voice or on modern and early instruments. May be repeated for credit. Available only to upperclass students concentrating in music literature and performance. *Prereq.* *Permission of instructor and department chair.*

MUS 1700 Introduction to Music (Honors) **4 QH**

Honors equivalent of MUS 1100.

MUS 1709 Introduction to Music and the Arts (Honors) **4 QH**

Honors equivalent of MUS 1109.

MUS 1800, MUS 1801, MUS 1802, MUS 1803, MUS 1804, MUS 1805 Directed Study **4 QH each**

Focuses independent work in a selected area of music under the direction of one member of the department. Limits enrollment to qualified students by special arrangement with the supervising faculty member and with the approval of the department chair.

MUS 1810, MUS 1811, MUS 1812 Junior/Senior Honors Program **4 QH each**

For details, contact the Honors Office, 183 Holmes.

INT 1110 American Musical Theatre **4 QH**

Traces the development of the American musical from works such as *The Black Crook* to the present. Considers the role of musical theater as both entertainment and serious art form through an examination of script, score, dance, and design. Studies works by composers and lyricists such as Bernstein, Rodgers and Hammerstein, the Gershwins, Weill, Lerner and Loewe, and Cole Porter.

Courses at the New England Conservatory

A limited number of qualified students will be able to take selected courses at the New England Conservatory of Music. Regular academic credit will be granted. For information, contact the chair of the department.

Philosophy and Religion

Some courses in the College of Arts and Sciences are duplicated in different departments or colleges or within a department. You may not receive credit for two such courses. If you have a question about whether one course overlaps another, please consult the departments involved and the Office of the Dean before taking the course.

Numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 2.

PHL 1100 Introduction to Philosophy 4 QH

Introduces students to philosophy by acquainting them with the theories and arguments of classical and contemporary philosophers and by teaching the skills of constructing and analyzing arguments. Emphasizes philosophical inquiry. Covers typical areas such as questions about the basis of morality, free will versus determinism, the existence of God, the problem of suffering, and the nature of knowledge. (II)

PHL 1110 Introduction to Religion 4 QH

Seeks to identify and appraise different ways of being religious: primitive, mystical, dogmatic, and ritual. Emphasizes appreciating the unique standpoint that each requires, how each sees the world in a radically different way, and how that leads to distinctive ways of life. (II)

PHL 1115 Understanding Religious Man 4 QH

Examines several important explanations of the nature, origin, and present significance of religious experience, beliefs, and practices in the light of modern knowledge and attitudes.

PHL 1130 Ethics: East and West 4 QH

Is there a best way to live? Is there a way a human being should live? In both Eastern and Western philosophy there are claims that a way of life exists that leads to happiness, power, and wisdom. This course explores this claim by studying the thought of such philosophers as Socrates, Buddha, Plato, Aristotle, Lao Tzu, Epictetus, Marcus Aurelius, Aquinas, and Spinoza, as well as by studying some of the classical Hindu and Buddhist texts. (V)

PHL 1135 Philosophical Problems of Law and Justice 4 QH

Focuses on two general questions: What is the proper scope of the law? And how should the law be enforced? Under the first question, deals with a number of issues such as whether the law has a legitimate right to restrict such activities as the use of drugs, deviant sexual practices, or gambling. Under the second question deals with the justification of punishment, rehabilitation as an alternative to punishment, and the death penalty. (VI)

PHL 1140 Social and Political Philosophy 4 QH

Focuses on basic questions about the nature of the state and the relationship of individuals to the state. What basis is there for individuals to obey the laws of the state? What conditions must a government meet to be legitimate? What justification can be given for democratic forms of government? What sorts of controls should the state exert over citizens?

What benefits do citizens have a right to expect from the state? Includes readings from both classical and contemporary sources. (V) *Prereq.* 4 QH philosophy.

PHL 1145 Technology and Human Values 4 QH

Examines the changing values of the modern, technologically advanced world. Attempts to increase our understanding of the supposed breach between the literary and scientific cultures, the diverse approaches toward their reconciliation, and the human dimensions of science and technology. Considers other relevant topics such as the neutrality of technology with respect to good or evil uses, technology as an instrument for human liberation, and the issue of proper and effective modes of controlling technology in today's world. Studies Pirsig's widely read paperback, *Zen and the Art of Motorcycle Maintenance*, as well as Lynn White's *Dynamo and Virgin Reconsidered*. Also considers other important writers, including Kurt Baler, Jacob Bronowski, Barry Commoner, Erich Fromm, Karl Marx, and C. P. Snow. (VI)

PHL 1150 Technology and the Individual 4 QH

Attempts to awaken some philosophical reflectiveness regarding the potential benefits and threats to individuals that derive from technological change. Explores such issues as the relation of technology to human freedom and privacy; the effects of "future shock" on the individual; the possibility of the tyranny of a technological elite; and the prospects for the transformation of humankind. Discusses writers who see technology as the salvation of humanity; writers who see technology leading to dehumanization, a decrease of freedom, and a developing sense of alienation; and still other writers who see the extinction of "human nature" as we once knew it. Where is the truth in all of this? What are the social, psychological, and philosophical meanings and consequences of technological change in our day and in the future? Includes major readings from Alvin Toffler's *Future Shock*, Herbert Marcuse's *One Dimensional Man*, Jacques Ellul's important criticism *The Technological Society*, and Lewis Mumford's *The Transformation of Man*.

PHL 1155 The Ethics of Human and Animal Experimentation 4 QH

Explores the conflicts that arise between the value of free scientific inquiry on the one hand and the rights, vulnerabilities, and suffering of human and animal subjects on the other. Considers traditional issues involving informed consent, voluntariness, coercion, experimental design, risk-benefit analyses,

institutional review boards, and professional guidelines, as well as such less traditional issues as the competing conceptions of progress, whether we have obligations to nonhuman animals, and what, if anything, justifies us in treating animals in ways in which we know we should not treat humans. (VI)

PHL 1160 Ethical Issues of Taxation **4 QH**

Although we tend to believe that persons have a right to their own labor, a right to their own property, and a right to exchange their labor or property for the labor or property of other consenting adults, it seems that income taxes, property taxes, and sales taxes violate these rights. This course explores two basic questions: Is any taxation morally justified? Are there moral grounds for choosing among taxation policies? Specific topics include competing conceptions of private property; the "progressive versus regressive taxation" controversy; the "flat tax" controversy; the alleged problems with interpersonal utility comparisons; and questions involving the distribution of tax monies, e.g., whether those who have more than they need have any moral obligation to provide for the needs of the poor. (VI)

PHL 1165 Moral Problems in Medicine **4 QH**

Examines two fundamental ethical systems, one of which is grounded on the dignity of the person, the other on the intrinsic value of happiness. Then explores the difficult issues of euthanasia, suicide, paternalism, medical experimentation, the patient's right to consent to any therapeutic intervention, and the concept of death with dignity. Examines the larger economic and policy issues of justice, some of which are current in political debates (for example: Is there a right to health care?). Encourages the student to become more sensitive to moral problems as they arise in medical settings, to be better able to deal with these troublesome issues, and perhaps to be more courageous in facing them if that becomes necessary. Also offers an investigation into the questions of abortion, euthanasia, infanticide, genetic counseling, psychosurgery, and human experimentation from the standpoint of both philosophical ethics (such as the theory of the end justifying the means) and religious ethics (such as the natural-law theory of the Roman Catholic Church). (VI)

PHL 1180 Ecology Ethics **4 QH**

Investigates the Gaia hypothesis, the view that the earth is a self-regulating ecosystem. Focuses on a current ecological crisis, the greenhouse effect, and on one of its major causes, deforestation. Addresses the values that underlie our concern over this and other ecological crises, whether the values at issue are anthropocentric or biocentric. Explores the ethical implications these ecological concerns have for our individual lifestyles, and for our role as members of communities. Explores how we should live as creative, responsible, and fulfilled beings on the planet.

PHL 1200 Introduction to Logic 1* **4 QH**

Introduces the logic of propositions and the syllogism. Examines principles of critical reasoning and fallacies. Provides practice in applying logical techniques to the creation and criticism of argument. (II)

PHL 1203 Introduction to Logic 2* **4 QH**

Further studies the techniques of logic in the analysis and creation of argument. Explores the logic of predicates, quantifiers, and relations. Provides practice in applying these techniques to natural arguments. Considers the forms of definition and the evaluation of empirical generalizations. (Overlaps PHL 1215.) (II)

PHL 1215 Symbolic Logic* **4 QH**

Focuses on the syntax and semantics of propositional logic and first order quantification theory. Considers relations between these systems and natural language. Covers analysis of the notion of derivation within a system, the notion of logical consequence, and practice in analyzing logical structure in natural language sentences. (II)

PHL 1225 Ancient Philosophy **4 QH**

Explores classical Greek philosophy; starts with a study/discussion of the roots of Western thought in the sixth century B.C. and argues the reasons for our debt to these original thinkers who were concerned with explaining the principles of external nature and the problems of human knowledge and conduct. Studies Socrates and his adversaries, the Sophists, and the two major figures he influenced: Plato and Aristotle. Also covers Roman philosophy, the Stoics, and the Sceptics, who are a prelude to the early Christian philosophers of the first century A.D. Places attention on the interplay between philosophers and the moral, social, and religious context in which their thought arises. Emphasizes student participation in class discussion. (III)

PHL 1230 Modern Philosophy **4 QH**

The 100 years between 1650 and 1750, sometimes called "the century of genius," were a period in which philosophers reacted to the new scientific discoveries of Copernicus, Kepler, and Galileo. Out of this reaction came new ways of thinking about the nature of knowledge and the nature of the world itself. The course focuses on the development of the rationalist and empirical philosophies during this period, with emphasis on Descartes, Leibniz, Spinoza, Locke, Berkeley, and Hume. (III) *Prereq.* 8 QH philosophy.

PHL 1243 Existentialism **4 QH**

Examines existentialist philosophy in its greatest representatives, such as Kierkegaard, Nietzsche, Dostoevski, Heidegger, Jaspers, and Camus, with major attention given to Jean-Paul Sartre and Maurice Merleau-Ponty. Focuses on central themes, including self-alienation, unauthenticity, authenticity, and existential experiences. Examines existential philosophy in its historical, social, and cultural relations, and in its influence on psychology, psychoanalysis, sociology, political science, and literature, both in Europe and in the United States. *Prereq.* 4 QH philosophy.

PHL 1245 Analytic Philosophy **4 QH**

Traces the development of the analytic movement from its beginnings in the early works of Moore and Russell. Provides some treatment of Russell's logical

*Students should take either PHL 1200 and PHL 1203 or PHL 1200 and PHL 1215. Credit will not be given for all three courses.

atomism, the logical positivists, the thought of Ludwig Wittgenstein, and their widespread influence. *Prereq.* 8 QH *philosophy.*

PHL 1250 Chinese Philosophy

4 QH

Examines Chinese philosophy in the ancient period (until 221 B.C.). Emphasizes Confucianism, Taoism, and the *I Ching*. Also covers the Logicians, the Mohists, and the Legalists.

PHL 1255 Indian Philosophy

4 QH

Examines the two classical Indian philosophical systems of Hinduism and Buddhism. In examining Theravada Buddhism, explores the view that it is possible for us to live without anxiety or suffering if we overcome our ignorance of reality and master our desires. Next, explores Mahayana Buddhism and its ethics of compassion and its related metaphysics of "voidness." In this part of the course, examines questions that, in the West, are thought of as questions about personal identity and the nature of the self. In exploring Hinduism, studies Vedic mysticism as it comes to us through the Upanishads, as well as the influential ethics of the Bhagavad Gita. Examines the question of whether the method of yoga and meditation is a reasonable method for learning about the fundamental nature of reality.

Using the classical texts of these systems, critically explores the techniques employed within these traditions: the method of yoga, the function of the guru, various methods of meditation, the point of nonviolence, the function of philosophical analysis, and the role of the austerities. Studies Hinduism as it is currently practiced in India, Theravada Buddhism as it is currently practiced in Sri Lanka and Thailand, the Tibetan tradition of Mahayana Buddhism, and the nonviolence of Gandhi.

Emphasizes that to study Indian philosophy is to study a tradition of philosophy in which ethics is not fragmented from epistemology, knowledge is more than justified true belief, and one's metaphysics is to be realized. Besides the classical texts, employs films and guest speakers. (IV)

PHL 1265 American Religions

4 QH

Approaches the American religious tradition from three perspectives. First, examines the transplanted and transformed European traditions in the context of American diversity and pluralism, especially the Protestant, Roman Catholic, and Jewish traditions. Second, looks into the rise and establishment of largely indigenous religious groups who have forged their own foundations in the midst of the older traditions, including the Mormons, the Hutterites, the Mennonites, the perfectionist groups (such as the older Oneida Community and the Shakers, and the more recent "cults"), and the black and Native American groups. Third, explores the theory of an American civil religion—the notion that there is a general religious meaning for American culture that makes the coexistence of the many religious groups possible and gives to that culture and its history a religious significance. Encourages students to achieve an understanding of what is unique and viable in the American religious tradition. (III)

PHL 1270 Western Religions

4 QH

Western religion is grounded in the experience of God's presence, which transcends and transfigures the life of the individual and the community. This encounter is the essence of Judaism, Christianity, and Islam. Drawing on autobiography and biography, this course delves into the personal religious quests of such major religious thinkers as St. Augustine, St. Theresa, Martin Luther, Elie Wiesel, Richard Rubenstein, Dietrich Bonhoeffer, and Mohammed.

PHL 1275 Eastern Religions

4 QH

Eastern religions appear to be fundamentally different from the orthodox religions of the West. Not only do Hinduism, Buddhism, and Taoism promise a solution to the problem of suffering (compare the common Christian and Jewish attitudes), but most of these religions do not have a central God personality, and some explicitly reject such a concept as meaningless or at least as irrelevant to leading a religious life. Central to these views is a way of being in the world that emphasizes meditation, skillful and compassionate action, and a direct awareness of the fundamental nature of reality. The course first tries to make sense of the difficult notion that the way we perceive reality may be illusory. It then examines Theravada Buddhism, a religion that rests on the insights that everything is impermanent and that it is possible to live fully in the present without any suffering. From Theravada Buddhism, the course turns to Mahayana Buddhism, and then to Taoism, a subtle view that emphasizes the "flow" of life and that "the way to do is to be." Next, the Hinduism of the Upanishads is examined. As part of the exploration of this form of Hinduism, students are given the opportunity to examine meditation intellectually and also to practice a few methods of meditation. In addition, the course investigates the devotional aspect of Hinduism as expressed in the Bhagavad Gita. There will also be an exploration of Zen. (IV)

PHL 1280 Islam

4 QH

Explores the history of Islam, its past and current conflicts with the West, Islamic beliefs, the future of Islam as a world religion, and relations of Islam with Christianity and Judaism. Examines social, political, and legal issues, as well as with the more familiar religious and theological questions. (IV)

PHL 1290 Cults and Sects

4 QH

Examines the varieties of religious experience from the perspectives of sociology and psychology of religion. Focuses on such cultic and sectarian groups as Christian Science, the American Shakers, the Unification Church, the Hare Krishna movement, and the Black Muslims. Provides the student the opportunity to acquire critical investigative tools with which to analyze different religious expressions.

PHL 1293 Mysticism: East and West

4 QH

Offers an inquiry into mystical experience through a comparative study of the writings of Christian, Buddhist, and Hindu mystics and of secondary interpretive sources. Considers potential oneness of

man and God, the conflict of mystics with traditional forms of religion, and the possibility of a common, cross-cultural basis for mysticism. *Prereq.* PHL 1115 or permission of instructor.

PHL 1295 Medicine, Religion, and the Healers' Art 4 QH
Explores aspects of the historical, religious, and cultural context for contemporary alternatives in health care, beginning with an examination of several examples of traditional healing practices and their accompanying religious and philosophical views about human life. Explores this "holistic" tradition in two frames of reference: the ascendancy of scientific rationalism over religion and the takeover, by male-dominated professions, of healing functions that society has traditionally assigned to women (e.g., the rise of obstetrics and the suppression of midwifery). Gives special attention to major women healers of the nineteenth century. Looks at some contemporary efforts at reintegration of scientific and traditional values in the modern health care system. Gives students the opportunity to meet and interact with patients and healers active in the modern holistic health movement.

PHL 1300 Religion in a Social Context 4 QH
Explores the social forms of religion. Describes and critically evaluates the structures and roles of the church, synagogue, and sect. In addition, emphasizes their functions, with reference to general social structure, process, and reform.

PHL 1305 Religion in the Age of Science 4 QH
Examines the problems posed by the interaction between religion and the natural and social sciences. Uses representative selections from Hume, Darwin, Marx, Freud, Erickson, and Troeltsch to interact with selections from Bultmann, Teilhard de Chardin, Niebuhr, Bonhoeffer, and Tillich.

PHL 1310 The Occult as Religion 4 QH
Focuses on the history, aims, and methods of such esoteric or mystic doctrines as astrology, numerology, magic, demonism, and divination and investigates the structural similarities of these religious forms to those of the dominant religious traditions of the world.

PHL 1315 Understanding the Bible 4 QH
Introduces students to the Old and New Testaments, so that they can enter into a dialogue with the Bible, understanding not only what it says, but why it is said that way. Focuses on the Bible's social, political, and cultural backgrounds. (III)

PHL 1320 The Meaning of Death 4 QH
Offers an inquiry into different philosophical and religious perspectives on death and life after death, including an examination of some powerful contemporary accounts of personal confrontation with death, along with investigations into attitudes toward death in other traditions for example, Hinduism and Buddhism. In addition, explores responses to the Holocaust in Europe and theories about life after death (such as those discussed in Raymond Moody's *Life After Life* and Ian Stevenson's *Reincarnation*). (V)

PHL 1325 Philosophy of Death, Grief, and Dying 4 QH
Explores fears about death and dying and the grieving process and examines the processes people sometimes experience while dying. In addition, examines current practices of caring for the dying and of coping with bereavement, questioning whether these practices are healthy, helpful, and/or ethical. Examines other relevant ethical issues, including euthanasia, truth-telling with the dying, suicide, and paternalism. Closes with the question of the meaning of life, given the fact that we must die.

PHL 1335 Moral Philosophy 4 QH
Explores two basic questions: What sorts of things are good and bad? What actions are right and wrong? Covers major classical conceptions of ancient Greece and Rome, their replacement by the Western religious ethic, its modification and rejection in the early modern period, and the emergence of modern versions of traditional conceptions of the good life, with reflections on the nature of ethical inquiry itself as a legitimate study. *Prereq.* 4 QH philosophy or religion or permission of instructor.

PHL 1340 Aesthetics 4 QH
Offers a historical approach to aesthetics, the philosophical analysis of concepts and the solution of problems that arise when one contemplates beautiful (or ugly) objects. Also explores standards of value in judging art by asking the following questions: What features make objects beautiful (or ugly)? Are there aesthetic standards? What is the relation of works of art to nature? What is the nature of an aesthetic experience? *Prereq.* 4 QH philosophy.

PHL 1345 Philosophy of Religion 4 QH
Asks the basic question "Does God exist?" Examines several major arguments affirming and criticizing the notion of God's existence. Explores a central problem in recent philosophy of religion of whether or not it makes any sense to speak of the truth (or falsity) of religious belief, as well as the implication an answer to that issue has for religious life. *Prereq.* 4 QH philosophy.

PHL 1350 Philosophy of Human Nature 4 QH
Offers a philosophical inquiry into the theories of man, man's dimensions, and human nature. Examines the question of the existence of human nature. Pays special attention to contemporary theories of man and self-alienation and their influence in social sciences. Includes selected readings from Descartes, Hobbes, Hegel, Marx, Kierkegaard, Maritain, Freud, Skinner, Fromm, and Frankl.

PHL 1355 Existentialism and Literature 4 QH
Explores existentialist philosophy, which after World Wars I and II inspired the literature of "extreme situations." Examines human extreme experiences in existentialist philosophy and novels. Considers the major themes of loneliness; self-alienation; social pressures; conformity; absurdity; anxiety; social, political, and moral crises; nothingness; and death. Includes readings from the most influential European and American authors.

PHL 1360 Philosophy and Literature**4 QH**

Provides the student the opportunity to learn to recognize, appreciate, and criticize philosophical themes in literature. Includes readings from acknowledged classics by philosophical authors such as Voltaire, Dostoevski, and Sartre; popular contemporary authors such as Vonnegut, Barth, and Pynchon; and readings from more straightforward philosophical sources. Examines the meaning of life, the human condition, depersonalization, alienation, human freedom, questions of value, responsibility, rationality, and personal identity. Explores religious, nihilistic, existential, and other viewpoints.

PHL 1370 The Meaning of Life**4 QH**

Examines selected philosophical problems of human existence in the contemporary world, with major emphasis on the search for identity and self-fulfillment. Discusses selected problems such as freedom, death, sexuality, alienation, becoming a person, and peak experiences. Includes readings from Kierkegaard, Heidegger, Sartre, Camus, Maslow, Allport, Frankl, Rogers, and Rollo May.

PHL 1375 Freud, Skinner, and Their Critics**4 QH**

Examines fundamental themes and concepts of Freud's psychoanalysis and Skinner's psychology from a philosophical perspective and criticisms of them from the point of view of reformed Freudians and existentialists. Includes selections from Freud, Jung, Adler, Karen Horney, Skinner, Koestler, Pearls, Sartre, Merleau-Ponty, and Kovaly. *Prereq.* 4 QH *philosophy or permission of instructor.*

PHL 1400 Theory of Knowledge**4 QH**

Introduces epistemology, or theory of knowledge, which asks the following questions: What is knowledge? Is knowledge (or even certainty) attainable? What are the limitations of human knowledge? How is knowledge—if we have it—acquired? What roles do reason and experience play in the attempt to attain knowledge? Studies both classical (Rene Descartes and David Hume) and contemporary sources (Bertrand Russell and others). Examines and criticizes various theories of knowledge, such as empiricism, rationalism, and scepticism. Encourages students to form at least tentative opinions on these issues. *Prereq.* 4 QH *philosophy or permission of instructor.*

PHL 1405 Metaphysics**4 QH**

Considers central problems and theories concerning the nature of reality, with special attention to such areas as the relation between mind and matter, free will and determinism, and criteria of existence. *Prereq.* 8 QH *philosophy.*

PHL 1410 Philosophy of Science**4 QH**

Focuses on the nature of scientific method, scientific theories, and scientific explanations. Examines the central question of why science is thought to provide the most reliable account of the nature of reality. Considers various theories about the nature and reliability of science. *Prereq.* 4 QH *philosophy.*

PHL 1415 Advanced Logic**4 QH**

Studies the major results in the meta-theory of first order logic. Examines consistency, completeness, and decidability. Discusses the general notion of an effectively computable process, Church's thesis, and the existence of unsolvable problems. *Prereq.* PHL 1215.

PHL 1430 Philosophy of Psychology**4 QH**

Examines the philosophical and scientific foundations of behavioristic psychology, with emphasis on the acquisition and use of language. Discusses alternative conceptions, for example, Chomsky's and those arising from computer studies. *Prereq.* 4 QH *philosophy or 4 QH psychology or permission of instructor.*

PHL 1435 Philosophy of Mind**4 QH**

Seeks to show what puzzles and problems result from an honest attempt to answer these questions in a reasonable way: What is the relation between mind and body? Is the mental merely a function of bodily process and behavior, or does it somehow exist "over and above" the material? How are self-knowledge and knowledge of other minds achieved? What is the relation between words and thoughts? Examines classical sources, such as Descartes and Locke, and contemporary sources, such as Wittgenstein and Putnam. Also seeks to arrive at some answers—however tentative or provisional—to these questions. Constantly, challenges the student to think and write well about these difficult subjects. *Prereq.* 4 QH *philosophy.*

PHL 1440 Philosophy of Language**4 QH**

Examines prospects for a theory of language, its syntax, and its semantics. Examines contrasts between theory of reference and theory of meaning. Asks whether there are universals of language? Analyzes relations between linguistics and psychology. Includes readings from Frege, Quine, Russell, Chomsky, and Fodor. *Prereq.* *Permission of instructor.*

PHL 1550, PHL 1551, PHL 1552**4 QH each****Honors 1, 2, and 3**

Students interested in taking junior/senior honors courses should confer with the department chair. Arrangements are made between the student and a member of the faculty. Staffing is by arrangement.

PHL 1565 Seminar in Wittgenstein**4 QH**

Ludwig Wittgenstein is one of the most influential, if not the most influential, philosophers of the twentieth century. A mysterious yet charismatic figure, he possessed both analytic genius and the creativity of a visionary. With unparalleled intensity, he addressed himself to philosophical problems. What is the relationship between language and the world? Are there thoughts "too deep" for words? What, if anything, can be said about the mystical, the beautiful, and the religious? What is consciousness and what is its role in action? What are the big, simple, mistaken ideas that cripple the philosophical enterprise? How

should philosophers proceed? What is meaningful? Wittgenstein's thought is so unique that it cannot be said that any other course or courses in philosophy will prepare the student for it. On the other hand, intelligent students with little formal preparation can profit from a study of Wittgenstein, given the proper dedication to truth. *Prereq.* 8 QH philosophy or permission of instructor.

PHL 1700 Introduction to Philosophy (Honors) 4 QH
Honors equivalent of PHL 1100.

PHL 1740 Social and Political Philosophy (Honors) 4 QH
Honors equivalent of PHL 1140.

PHL 1800 Directed Studies 4 QH
Those interested in the directed studies program should meet with the department chair. *Prereq.* By arrangement between student and faculty.

PHL 3265 Issues in Medical Ethics 4 QH
Focuses on issues in medical ethics, especially as they are likely to arise in a clinical setting. Begins

with exploration of the two basic systems of ethical theory and then concentrates on their application in cases exemplifying the issues of euthanasia, paternalism, experimentation, informed consent, quality of life, professional responsibility, right to health care, truth telling, genetic control, abortion, and the allocation of scarce medical resources. *Prereq.* Permission of instructor.

INT 1400 Professional Practices: Individual and Social Dimensions 4 QH

Explores the dimensions and dilemmas of freedom and responsibility confronting professional people practicing within the limits set by socioeconomic conditions, clients, and peers. Examines case histories to illustrate the dilemmas professionals face, the choices that are typically made, and the consequences these have on the freedom of the practitioner and on personal and professional integrity.

Physics

Some courses in the College of Arts and Sciences are duplicated in different departments or colleges or within a department. You may not receive credit for two such courses. If you have a question about whether one course overlaps another, please consult the departments involved and the Office of the Dean before taking the course.

Numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 2.

Courses are listed according to level and degree of specialization. General interest courses have no prerequisites and may be used to satisfy College of Arts and Sciences distribution requirements in science. Introductory physics courses are basic first-year physics lecture courses; the corresponding labs are listed under "Introductory Physics Laboratories." Advanced physics and astronomy courses require one year of introductory physics and may be used to satisfy degree requirements for physics majors.

General Interest Courses

PHY 1101 Physics in Music 4 QH
Discusses the physical principles involved in producing, recording, and reproducing music. Explains the operation of various instruments in terms of the basic properties of resonances and waves; physical and psychological response of the ear; the physical basis of the modern (well-tempered) system of tuning; the operation of microphones, amplifiers, loud speakers, tape recorders, radios, and other devices.

PHY 1111 Introduction to Astronomy I 4 QH
The first of a two-quarter sequence, offers the non-science student an introduction to modern astronomical ideas. Includes such topics as introduction to the cosmos; tools of the astronomer (atoms, the nature of light and radiation, telescopes, space astronomy); the earth in space; our solar system (origin and future of the solar system, the planets and other bodies, the latest from spacecraft flights, the sun as our bridge to the stars); the question of life in the universe. (II)

PHY 1121 Introduction to Science I 4 QH
With PHY 1122, forms a two-quarter sequence for nonscience majors that provides an interdisciplinary

treatment of the basic ideas of the natural sciences. Discusses concepts such as energy, gravity, and the atom, followed by a consideration of the ways in which atoms combine to form the substances that comprise matter. (II)

Introductory Physics Courses

PHY 1191 Physics I 4 QH
Focuses on units and scientific notation, force, Newton's first law, static equilibrium, Newton's second law, momentum, work, kinetic energy, potential energy. *Prereq.* MTH 1191, which may be taken concurrently; BET majors only.

PHY 1192 Physics 2 4 QH
Focuses on power, rotational motion, Pascal's law, hydrostatic pressure, molecular mass, ideal gas law, first and second laws of thermodynamics, simple harmonic motion, wave motion, sound, and light. *Prereq.* PHY 1191; MTH 1192, which may be taken concurrently; BET majors only.

PHY 1193 Physics 3 4 QH
Focuses on electrostatics, circuit elements, direct current circuits, magnetism, electromagnetic induction, electromagnetic waves, atomic and nuclear physics. *Prereq.* PHY 1192; *BET majors only.*

PHY 1201 Physics for the Life Sciences 1 4 QH
Focuses on vector addition of force, principles of statics; Newton's second law, kinetic and potential energy; pressure static properties of fluids, fluid flow. To take the lab for this course, register for PHY 1501 concurrently. (II)

PHY 1202 Physics for the Life Sciences 2 4 QH
Focuses on wave motion, sound, light, optics, static electricity, DC circuits, magnetism. To take the lab for this course, register for PHY 1502 concurrently. (II) *Prereq.* PHY 1201.

PHY 1203 Physics for the Life Sciences 3 4 QH
Focuses on temperature, gas laws, properties of liquids (surface tension and osmotic pressure), properties of solids, thermal physics, Coulomb's law, and atomic and nuclear physics. *Prereq.* PHY 1202.

PHY 1209 Basic Physics 1 4 QH
Focuses on the physical properties of gases and condensed matter, force and pressure, hydrostatics, ideal and real gases, condensation and evaporation, surface tension, osmosis and fluid flow. Includes lab as an integral part of the course. *For respiratory therapy students only.*

PHY 1221 Physics for Engineering Students 1 4 QH
The first quarter of a four quarter sequence intended primarily for engineering students, covers mechanics, kinematics, dynamics, Newton's laws, work, energy, linear momentum, collisions. *Prereq.* MTH 1123 or *equiv.*, which may be taken concurrently.

PHY 1222 Physics for Engineering Students 2 4 QH
Continues PHY 1221. Focuses on rotational dynamics, angular momentum, statics, harmonic motion, wave motion, sound, and optics. *Prereq.* PHY 1221; MTH 1124 or *equiv.*, which may be taken concurrently.

PHY 1223 Physics for Engineering Students 3 4 QH
Continues PHY 1222. Focuses on electricity, electrostatics, Gauss's law, electric fields, potential, capacitance, resistance, current Ohm's law, circuits, the magnetic field. *Prereq.* PHY 1222; MTH 1125 or *equiv.*, which may be taken concurrently.

PHY 1224 Physics for Engineering Students 4 4 QH
Continues PHY 1223. Covers induction, inductance, and energy in the magnetic field; electromagnetic waves; exponential processes; and elementary thermodynamics. *Prereq.* PHY 1223; and MTH 1126 or *equiv.*, which may be taken concurrently.

PHY 1231 Physics for Science Majors 1 4 QH
Focuses on mechanics, kinematics, Newton's laws, circular motion, work energy, and linear momentum. To take the lab for this course, register for PHY 1531 concurrently. (II) *Prereq.* MTH 1143 or *equiv.*, which may be taken concurrently.

PHY 1232 Physics for Science Majors 2 4 QH
Focuses on rotational motion, angular momentum, harmonic motion, wave motion, sound, heat and thermodynamics, kinetic theory. To take the lab for this course, register for PHY 1532 concurrently. (II) *Prereq.* PHY 1231; and MTH 1144 or *equiv.*, which may be taken concurrently.

PHY 1233 Physics for Science Majors 3 4 QH
Focuses on electricity and magnetism; circuits; electromagnetic waves; topics in modern physics. To take the lab for this course, register for PHY 1533 concurrently. *Prereq.* PHY 1231; and MTH 1145 or *equiv.*, which may be taken concurrently.

PHY 1251 Physics Review for Engineering Students 6 QH
Offers an intensive review for students who have had previous college physics courses not equivalent to the engineering sequence of PHY 1221 through PHY 1224. Covers fundamentals of mechanics, electricity, and magnetism, with emphasis on the use of vectors and elementary calculus. Equivalent to PHY 1223 and PHY 1224. *Prereq.* One year of college physics and knowledge of elementary calculus.

Introductory Physics Laboratories

PHY 1194 Physics Laboratory 1 2 QH
Covers experiments from various physics topics covered in PHY 1191 and, concurrently, in PHY 1192. Lab fee. *Prereq.* PHY 1191; PHY 1192 concurrently; *BET majors only.*

PHY 1195 Physics Laboratory 2 2 QH
Covers experiments from various physics topics covered in PHY 1192 and, concurrently, PHY 1193. Lab fee. *Prereq.* PHY 1194, PHY 1192; PHY 1193 concurrently; *BET majors only.*

PHY 1501 Physics Laboratory for the Life Sciences 1 1 QH
Accompanies PHY 1201. *Prereq.* PHY 1201 concurrently.

PHY 1502 Physics Laboratory for the Life Sciences 2 1 QH
Accompanies PHY 1202. *Prereq.* PHY 1501; PHY 1202 or PHY 1203 concurrently.

PHY 1521 Physics Laboratory for Engineering Students 1 1 QH
The first of a two-quarter lab sequence in which the student performs experiments from various fields of physics. *Prereq.* PHY 1223.

PHY 1522 Physics Laboratory for Engineering Students 2 1 QH
Continues PHY 1521. *Prereq.* PHY 1521 and PHY 1224.

PHY 1531 Physics Laboratory for Science Majors 1 1 QH
Focuses on lab experiments related to topics covered in PHY 1231. *Prereq.* PHY 1231 concurrently.

PHY 1532 Physics Laboratory for Science Majors 2 1 QH
Focuses on lab experiments related to topics covered in PHY 1232. *Prereq.* PHY 1531; PHY 1232 concurrently.

PHY 1533 Physics Laboratory for Science Majors 3 1 QH
Focuses on lab experiments related to topics covered in PHY 1233. *Prereq.* PHY 1531; PHY 1233 concurrently.

Advanced Physics and Astronomy Courses

PHY 1301 Intermediate Mechanics 4 QH
Focuses on classical mechanics in two and three dimensions; a review of Newton's laws; special emphasis on conservation theorems for energy, momentum, and angular momentum; harmonic and wave motion. *Prereq.* PHY 1232 and PHY 1233; and MTH 1243 concurrently.

PHY 1302 Electric and Magnetic Fields 4 QH
Focuses on the basic concepts of electric and magnetic fields, including electric and magnetic fields in free space and materials; Maxwell's equations in integral form. *Prereq.* PHY 1301; and MTH 1244 concurrently.

PHY 1303 Modern Physics 4 QH
Reviews experiments demonstrating the atomic nature of matter, the properties of the electron, the nuclear atom, the wave-particle duality, spin, and the properties of elementary particles. Discusses, mostly on a phenomenological level, such subjects as atomic and nuclear structure, properties of the solid state, and elementary particles. *Prereq.* PHY 1233, PHY 1224, or equiv.

PHY 1304 Mathematical Physics 4 QH
Reviews linear algebra and vector calculus, special functions and partial differential equations of physics, potential theory, functions of a complex variable. *Prereq.* MTH 1244 and PHY 1233; and MTH 1246 concurrently.

PHY 1305 Thermodynamics and Kinetic Theory 4 QH
Focuses on first and second laws of thermodynamics, entropy and equilibrium, thermodynamic potentials, elementary kinetic theory, statistical mechanics and the statistical interpretation of entropy. *Prereq.* PHY 1224 or PHY 1233; and MTH 1244.

PHY 1401 Classical Mechanics 4 QH
Covers advanced topics in classical mechanics, including vector kinematics, harmonic oscillator and resonance, generalized coordinates, Lagrange's equations, central forces and the Kepler problem, rigid body motion. *Prereq.* PHY 1301 and MTH 1245.

PHY 1402 Electricity and Magnetism 1 4 QH
Covers Maxwell's equations and their experimental basis, electrostatics and magnetostatics, the electromagnetic field in empty space, electromagnetic waves. *Prereq.* PHY 1302; and PHY 1304 or equiv.

PHY 1403 Electricity and Magnetism 2 4 QH
Continues PHY 1402. Focuses on energy and momentum in the electromagnetic field, electrodynamics, the interaction of matter and the field, radiation. *Prereq.* PHY 1402 or equiv.

PHY 1404 Wave Motion and Optics 4 QH
Focuses on harmonic and coupled oscillators, wave equation; geometrical and physical optics; interference, diffraction, optics of solids, amplification of light; and lasers. *Prereq.* PHY 1302.

PHY 1411 Introduction to Astrophysics and Cosmology 4 QH
Introduces the student to current ideas in astrophysics and cosmology, with emphasis on recent advances in this field. Focuses on tools of the astronomer (gamma-, X-, UV-, optical-, infrared-, radio-telescopes, spectrometers, spacecrafts, and so on); solar system; stellar properties (site luminosity); stellar spectra; Hertzsprung-Russell diagram; stellar energy sources (gravitational, nuclear); evolution of stars (birth, main sequence, red giants, white dwarfs, planetary nebulae, supernovae, neutron stars and pulsars, black holes and gravitational collapse); methods of interstellar and intergalactic distance measurement; our Milky Way galaxy; extragalactic objects (galaxies, clusters of galaxies, radio galaxies, quasars); cosmology (Olber's paradox; recession of galaxies, big bang theory, cosmic background radiation, formation of galaxies, the future of the universe). *Prereq.* Three quarters of elementary physics.

PHY 1413 Introduction to Nuclear Physics 4 QH
Focuses on nuclear structure, nuclear masses, radioactivity, nuclear radiation, interaction of radiation and matter, detectors, fission, nuclear forces, elementary particles. *Prereq.* PHY 1303.

PHY 1414 Introduction to Solid State Physics 4 QH
Offers a semiclassical treatment of the thermal, magnetic, and electrical properties of crystalline solids. Examines X-ray diffraction and the reciprocal lattice, elasticity and lattice vibrations, specific heat, properties of insulators, magnetism in insulators and metals, and introduction to the band theory of metals. *Prereq.* CHM 1383 or PHY 1303; and PHY 1305 or equiv.

PHY 1415 Quantum Mechanics 1 4 QH
Focuses on observation of macroscopic and microscopic bodies, the uncertainty principle, wave-particle duality, probability amplitudes, Schrodinger wave theory, and one-dimensional problems. *Prereq.* CHM 1383 or PHY 1303; and PHY 1304 or equiv.

PHY 1416 Quantum Mechanics 2 4 QH
Continues PHY 1415. Covers discrete and continuous states, Schrodinger equation in three dimensions, angular momentum, general theory of quantum mechanics, applications. *Prereq.* PHY 1415.

PHY 1551 Electronics for Scientists 1 4 QH
With PHY 1552, forms a two-quarter sequence covering electronic techniques for experimental research in many different fields of science. Focuses on principles of semiconductor devices; analog techniques (amplification, feedback, integration); digital techniques (counting, multiplexing, logic); design of electronic subsystems (analog-to-digital converters,

phase-sensitive detectors, data-logging systems); understanding specifications of commercial electronic equipment. In lab examples, makes use of up-to-date integrated and discrete devices such as are currently used in the electronic industry.

PHY 1552 Electronics for Scientists 2 4 QH
Continues PHY 1551. *Prereq.* PHY 1551.

PHY 1555 Wave Laboratory 4 QH
Offers a general treatment of the problems of mechanical and electromagnetic radiation as wave phenomena. Focuses on the differential wave equation and its application to selected topics; interference and diffraction theory from the standpoint of the Huygens-Fresnel and Kirchhoff formulations; selected experiments in acoustics, optics, and microwaves to illustrate these problems. *Prereq.* PHY 1224 or PHY 1302.

PHY 1557 Advanced Physics Laboratory 4 QH
Presents special projects in modern experimental physics, including electronic instrumentation used in measuring physical quantities and use of microprocessors. *Prereq.* PHY 1551 and PHY 1552.

PHY 1561 Project Laboratory 4 QH
Allows students to select and carry out individual projects involving instrumentation and computation. Involves the development of some aspect of instrumentation and/or computation in an ongoing research project and the preparation of a final report. The student will be supervised by the project leader and the course instructor. (Although the course carries 4 QH credit, it is taken in successive winter and spring quarters.) *Prereq.* *Permission of instructor.*

PHY 1711 Introduction to Astronomy I (Honors) 4 QH
Honors equivalent of PHY 1111.

PHY 1721 Physics 1 (Engineering) 4 QH
Honors equivalent of PHY 1221

PHY 1722 Physics 2 (Engineering) 4 QH
Honors equivalent of PHY 1222

PHY 1723 Physics 3 (Engineering) 4 QH
Honors equivalent of PHY 1223.

PHY 1724 Physics 4 (Engineering) 4 QH
Honors equivalent of PHY 1224.

PHY 1811, PHY 1812, PHY 1813 1 QH each
Independent Study

PHY 1821, PHY 1822, PHY 1823 2 QH each
Independent Study

PHY 1831, PHY 1832, PHY 1833 3 QH each
Independent Study

PHY 1841, PHY 1842, PHY 1843 4 QH each
Independent Study

PHY 1885, PHY 1886, PHY 1887 4 QH each
Junior/Senior Honors Program
For details, contact the Honors Office, 183 Holmes.

INT 1570 On Understanding Science 4 QH
Develops the quantitative and qualitative skills needed to critically read about science in newspapers and magazines. Examines the historical, philosophical, and social nature of science; units and scientific notation; technological developments of the last two hundred years; sources of information; and current scientific developments.

Political Science

Some courses in the College of Arts and Sciences are duplicated in different departments or colleges or within a department. You may not receive credit for two such courses. If you have a question about whether one course overlaps another, please consult the departments involved and the Office of the Dean before taking the course.

The numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 2.

POL 1110 Introduction to Politics 4 QH
Offers a broad-based introduction to contemporary political science. Includes a consideration of basic concepts in political analysis (for example, power, authority, and sovereignty), the role of governmental institutions in the making of public policy, public opinion and processes of political representation, contemporary political ideologies, and the scope and methods of political science. (II)

POL 1111 Introduction to American Government 4 QH
Analyzes the American governmental and political processes by focusing on constitutionalism, liberties, institutions, and political behavior. (II)

POL 1112 Introduction to International Relations 4 QH
Applies basic theories of international relations to examining the foreign policies of the key actors in

the international system. Covers topics of international aid, trade, and monetary affairs; issues relating to the arms race, nuclear proliferation, arms control, and disarmament; international law and organizations, human rights, and the impact of technology on the functioning of the international system. (II)

POL 1113 Introduction to Foreign Governments and Societies 4 QH

Offers a comparative study of parliamentary democracy in Western Europe; Communist totalitarianism in the Soviet Union, China, and Eastern Europe; and variations of these governmental systems in the third world countries of Asia, Africa, and the Middle East. Formerly "Introduction to Comparative Government."

POL 1260 Public Policy Analysis 4 QH

Analyzes and evaluates public policy in the United States. (VI)

POL 1261 Public Administration 4 QH

Focuses on the theory and practice of public administration, emphasizing the generalities of institutions, processes, and behavior of bureaucratic organizations.

POL 1262 Organization Theory 4 QH

Provides a broad overview of organization theories, their history, and development. Gives specific attention to developing a paradigm for public organizations that focuses on the relationships of economic, democratic, bureaucratic, technological, and humanistic imperatives. Requires the student to prepare a research paper and consider the implications of this paradigm for future organizations.

POL 1266 Public Personnel Administration 4 QH

Presents an overall introduction to the field of public personnel administration. Examines selected topics such as recruitment, selection, classification, case development, equal opportunity, public employee unionism, and collective bargaining. *Prereq.* POL 1261.

POL 1267 Public Budgeting 4 QH

Focuses on the function of budgeting in a variety of governmental contexts, specifically, the appropriations process, the budget as a management tool, and the public policy impacts of the budget. Emphasizes budgeting techniques within this context. *Prereq.* POL 1261.

POL 1300 Conceptual Foundations of Contemporary Political Analyses 4 QH

Provides an introduction to the conceptual problems associated with the study of politics, including scientific method and a general overview of various methodological perspectives (for example, systems theory, game theory, and survey analysis) as practiced by contemporary political scientists.

POL 1301 Research Methods 1 4 QH

Offers an introduction to the principal quantitative methods used in political analysis, public administration, political behavior, international relations, and policy sciences. Emphasizes basic statistical techniques, survey methods, and SPSS programming.

POL 1302 Research Methods 2 4 QH

Focuses on methods of quantitative analysis. Covers the following primary statistical topics: significance testing, bivariate regression and correlation, and multiple regression and correlation. In addition, teaches elementary computer skills and the use of the programming language Statistical Package for the Social Sciences (SPSS) to calculate advanced statistics. Emphasizes the practical application and understanding of statistical techniques by providing numerous examples in the areas of political behavior, public opinion, and public policy analysis. *Prereq.* POL 1301.

POL 1303 Political Behavior 4 QH

Examines selected topics in contemporary political science from a political behavior perspective. Focuses on political attitude formation and change, ideology, socialization, public opinion and voting behavior, political campaigning, political violence, and empirical democratic theory.

POL 1304 Practical Politics 4 QH

Accentuates and systematically treats some of the problems of organizing for effective citizen action, partisan and nonpartisan, at the grass-roots level. Explores roles in political campaigning.

POL 1306 Politics in Western Europe 4 QH

Offers a comparative analysis of political culture, federal and unitary forms of government, and executive-legislative relations on the national level in England, France, and West Germany. (III)

POL 1307 European Political Parties 4 QH

Focuses on political party organization and voter behavior in England, France, and Germany, with emphasis on party ideologies, strategies, campaigns, and elections, as well as socialization. Examines recruitment and participation of voters in the political process. *Prereq.* POL 1113.

POL 1308 The Politics of Poverty 4 QH

Explores what is referred to as the poverty system: how and why there is poverty, how it affects people's lives, and how it can be eliminated. As a discussion-centered course, relies on simulations, small-group work, and experience-based learning; examines the relations between poverty, racism, and the economic, political, and administrative systems. Evaluates a number of alternatives and provides an opportunity for clarifying individual assumptions and feelings about poverty.

POL 1309 The Politics of Imperialism 4 QH

Focuses on the political dynamics of penetration of foreign economies and foreign politics. Considers such elements as military intervention, foreign aid, and the impact of the multinational corporations.

POL 1310 American Ideology 4 QH

Analyzes the main American ideologies, including liberalism, neoliberalism, conservatism, neoconservatism, and nationalism. Examines the historic roots of each ideology and its impact on American politics. Explores the ongoing interaction of political ideology and the political process in contemporary American society. (V)

POL 1312 Politics and the Mass Media 4 QH

Analyzes several facets of the mass media: the role of newspapers, radio, and television in public opinion formation; their use and effectiveness in political campaigns; their objectivity and/or bias in reporting the news; their impact on political parties and the distribution of power between Congress and the President.

POL 1313 International Organization 4 QH

Focuses on development of international organizations with special emphasis on the United Nations system. (Public Administration elective.)

POL 1314 Interest Groups and Public Policy 4 QH

Surveys the roles of organized interests in American public policymaking. Examines why groups are formed, how they work, why they succeed or fail, and what cumulative impacts groups have on policy. Spans a variety of groups, from traditional economic interests to social movements, public interest organizations, and professional lobbyists.

POL 1315 The Politics of the Criminal Justice System 4 QH

Focuses on the criminal justice system, from arrest by police to appeal to the Supreme Court of the United States. Examines the roles of police, lawyers, judges, prosecutors, juries, and correction officers. *Prereq.* POL 1111 or POL 1377.

POL 1316 Contemporary Revolutionary Politics 4 QH

Examines political development in selected revolutionary societies, including Cuba. (VI)

POL 1317 Law and Society 4 QH

Examines the theory and practice of the American legal process and its impact on values. Analyzes the impact the military-industrial-technological complex has on these values. *Open to upperclass students only.*

POL 1318 State and Local Government 4 QH

Introduces students to the political and administrative context of state and local government and surveys the structure, function, and politics of states and localities within the context of the United States federal system. (Public Administration elective.) *Prereq.* POL 1111.

POL 1320 Political Parties, Pressure Groups, and Elections 4 QH

Analyzes political parties and pressure groups in the American political system, with attention given to policy making, elections, voting behavior, and state and national political trends.

POL 1321 Eurocommunism 4 QH

Examines the domestic and foreign policies of the Spanish, French, and Italian Communist parties, with special attention to their relations with the international communist movement.

POL 1322 World Politics 4 QH

Emphasizes various principles, techniques, and patterns that governments have followed to implement their goals or objectives. Uses a case study approach, with an emphasis on the problems associated with the Middle East analyzed from the United States-Soviet and Arab-Israeli viewpoints.

POL 1324 Urban Politics 4 QH

Analyzes the political, administrative, economic, and social dynamics of urban areas from a historical perspective. (Public Administration elective.)

POL 1325 Human Services Administration 4 QH

Studies the ways in which human services are provided by the political, economic, and bureaucratic

systems to low-income citizens. Helps students develop knowledge of the public policy process, human services organizations and delivery systems, and awareness of their values and potential as human services professionals. A discussion-based course for students interested in human services. (Public Administration elective.)

POL 1327 Sex Roles in American Politics 4 QH

Explores the relation between what is and what ought to be—and why—in the roles of women in American politics. Examines the traditional roles of women in politics, the suffrage movement, the woman as citizen and voter, the role of sex in achieving power and in political efficacy, and the place of women in “new politics.” Also covers political action to promote women’s issues and modern feminism. (VI)

POL 1328 Women in Public Management 4 QH

Examines the challenges and problems commonly experienced by female managers working in complex, public sector organizations. Emphasizes strategies for eliminating such problems. Focuses on career development for women in managerial roles.

POL 1329 American Social Welfare Policy 4 QH

Introduces social welfare policy, with emphasis on programs and services in the contemporary United States. Discusses theoretical frameworks for analyzing social welfare policy; then focuses attention on the substantive areas of welfare, mental health, and social security. Explores various issues and processes related to the design, administration, and implementation of social welfare policy in the context of the American socio-political system. Focuses on social welfare policymaking under the Reagan administration.

POL 1330 Minority Politics 4 QH

Examines the voting behavior of minority populations in the United States and political developments and trends that affects the nation’s minority communities.

POL 1331 Science, Technology, and Public Policy 4 QH

Considers the effects of science and technology on politics and policymaking in America and how politics influences science and technology. Focuses on the differences between scientific and democratic values and definitions of rationality, the nature of public problems, and why some problems are easier to “solve” than others. Particularly looks at such issues as nuclear power, recombinant DNA, abortion, and medical research; addresses the question of who should decide such complex matters. (VI)

POL 1332 Government and Politics of Japan 4 QH

Focuses on the development of Japan’s political system since World War II. Examines Japan’s political institutions and practice of democracy in the context of its political culture; the interrelationship between business and government; Japan’s foreign policy; and business practices and organization. Raises issues concerning Japan’s extraordinary economic success and the limitations of Japan as a model for other countries. (IV) *Not open to freshmen.*

POL 1333 Introduction to Urban and Regional Planning 4 QH

Traces the historical influences on American urban and regional planning and the contemporary institutional, theoretical, and technical issues in planning.

POL 1335 The American Presidency 4 QH

Examines the presidential electoral process and the constitutional and extraconstitutional powers of the American President. Studies presidential leadership styles and analyzes the relationship between the executive branch and Congress, the Court, the bureaucracy, and the media.

POL 1336 American Constitutional Law 4 QH

Employing excerpts of United States Supreme Court decisions and other reading materials, attempts to analyze some of the theoretical, structural, and substantive issues inherent in and relevant to the American constitutional system. *Prereq.* POL 1111 and junior or senior standing.

POL 1337 United States Foreign Policy 4 QH

Examines formulation and conduct of foreign policy and the United States since 1945.

POL 1338 Religion and Politics 4 QH

Explores the role of religion in domestic and international politics. Examines religion as a source of political tension and strife. Draws examples from the United States and the developing world. Covers Islamic fundamentalism in African and the Near East, Orthodox Jewish parties in Israel, Catholic liberation theology in Latin America, and Protestant fundamentalism and the religious right in America.

POL 1339 Current Political Issues 4 QH

Analyzes the constitutional and political background of selected contemporary public issues. Primarily for nonpolitical science majors.

POL 1340 Communism in Eastern Europe 4 QH

Focuses on the Communist governments of Eastern Europe, with emphasis on their growing independence from Soviet Russia. Studies recent political change, economic liberalization, and new orientation in foreign policy.

POL 1342 Crisis and Conflict in Black Africa 4 QH

Using films, maps, news clips, discussions, and readings, explores contemporary politics in African nations south of the Sahara. Studies South Africa, Nigeria, Kenya, and Ethiopia, among others. Examines apartheid, colonialism, Afro-Marxism, chieftancy, development, and Pan-Africanism. (VI)

POL 1343 Politics and Violence in Northern Ireland 4 QH

Analyzes the causes of violence in Northern Ireland. Considers historical, sociological, and economic roots of the conflict, but places major emphasis on politics. Also discusses the international dimension (the roles of southern Ireland, the United States, and so on), paramilitary organizations, legal political parties and groups, and potential solutions. Draws comparative parallels, including possible lessons for the United States.

POL 1345 Government and Politics in the Middle East 4 QH

Approaches the political, economic, military, and ideological factors within the Arab states and Israel, inter-Arab politics, the Arab-Israeli conflict, and the great power rivalry in the region. (VI)

POL 1347 Soviet Government 4 QH

Focuses on Soviet political origins and behavior, with emphasis on recent changes in the party and state apparatus, the economy, and the administration of justice.

POL 1348 Soviet Foreign Policy 4 QH

Focuses on the evolution of Soviet foreign policy since 1917, with emphasis on the development of the international communist movement and the onset of the East-West ideological conflict.

POL 1350 American Legislative Process 4 QH

Explores the structures, dynamics, and styles inherent in public policymaking within the U.S. Congress. Focuses on elections; representation of constituents' interests; the roles played by members, the president, interest groups, and other actors; and how all of this is affected by the structure of Congress and the processes embedded in the legislative body.

POL 1351 Techniques and Practices of Public Management 4 QH

Focuses on practical skills and techniques of public management. Employs the case method in examining typical management problems at different levels of government. Also covers time and resource management for public sector managerial personnel.

POL 1353 Law and Personal Morality 4 QH

Examines the use of political power to enforce standards of personal morality and behavior in contemporary American society. Considers such subjects as pornography, sexual privacy and expression, Sunday closing laws, abortion, and prostitution.

POL 1354 The Politics and Policies of Developing Nations 4 QH

Surveys recent political and related change among third world countries of Africa, Latin America, and Asia. Includes such topics as the heritage of colonialism and achievement of independence, the realities of cultural pluralism, revolution and political violence, institution building, political leadership and role of ideology, political parties, the military in politics, and the international aspects of political modernization. (VI)

POL 1355 Ethnic Conflict in International Perspective 4 QH

Offers a comparative study of ethnic conflict, with its religious, linguistic, racial, and economic roots, in such places as Nigeria, Cyprus, Canada, Northern Ireland, Belgium, and the United States. Also examines world-order implications and Great Power consequences of such confrontations.

POL 1357 Totalitarianism and Dictatorship 4 QH

Analyzes totalitarianism, dictatorship, and autocracy, including study of historical background, characteristics, theories of origin, nature, and

significance. Evaluates techniques, ideologies (for example, Marxism-Leninism), policies, and institutions. Gives particular attention to Soviet and German experiences.

POL 1359 Comparative Public Administration 4 QH

Provides a comparative study of the approaches to public administration in selected democratic governments in the United States and Europe.

POL 1360 The Politics of Revolution and Change 4 QH

Analyzes revolution and change, contemporary and historical, with attention to both theory and practice. Discusses major trends in contemporary politics and society and the relationship between political change and technological, scientific, or social change.

POL 1362 Civil Liberties 4 QH

Employing United States Supreme Court decisions and other reading material, examines the substantive and procedural guarantees of the Bill of Rights and the Fourteenth Amendment and their relation to a liberal democratic society.

POL 1363 Public Management 4 QH

What problems are entailed in the management of public agencies? How do public managers seek to solve these problems? Explores these questions through the use of descriptive, analytical, and case materials. (Public Administration elective.) *Prereq.* POL 1261.

POL 1364 Business and Government Relations 4 QH

Surveys the relation between economic developments and political processes in the United States. Considers government planning of the economy, monopoly and government regulation, government programs to promote social welfare, and the impact of Federalism on the political-economic system, among other topics.

POL 1365 British Politics and Government 1 4 QH

Studies British political culture, particularly traditional political values, attitudes, and expectations; the historical, economic, societal, and cultural determinants of them; and their impact on the working of the British political system today. Gives special attention to recent changes in British thought and society, that is, in the period from World War II to the present, and how they have affected contemporary British political behavior.

POL 1366 British Politics and Government 2 4 QH

Studies British political participation, including voting, interest groups, and political parties; and governmental institutions such as the monarchy, the Cabinet, Parliament, and the civil service. Gives special attention to leadership decision making, in particular ministerial accountability, and to current public policy in the areas of the economy, social security and welfare, and Ireland.

POL 1368 Government and Politics of Latin America 4 QH

Examines the governmental systems, political parties, socioeconomic problems, and foreign policies of Latin American states. Focuses on political change. (IV)

POL 1369 Political Violence 4 QH

Analyzes political violence in its various contemporary forms (for example, revolution, genocide, political terrorism, military overthrows). Assesses the causes and consequences of political violence (from both practical and moral points of view) and considers strategies for preventing and resolving political violence.

POL 1370 Political Theory 4 QH

Presents an analytic approach to the study of key political concepts: power, equality, freedom, authority, obligation, ethics, law, rights, punishment, state, sovereignty. *Prereq.* Junior or senior standing or permission of instructor.

POL 1371 Government and Politics of China 4 QH

Focuses on China's political system during Communist party rule. Addresses fundamental issues that the government has been unable to resolve successfully including leadership recruitment and succession; economic growth; class and class struggle; political culture and the educational system; the nature of socialist democracy and socialist legality; and the appropriate form of socialism for a country wishing to modernize rapidly. Examines the interaction among ideology, development, and culture on these issues. (IV) *Not open to freshmen.*

POL 1372 China's Foreign Relations 4 QH

Examines China's traditional view of international relations and its modification first by contact with the West and later by Marxism-Leninism. Investigates China's role in changing the international system to accord more with its perspectives on sovereignty, equality, and the principles of socialist internationalism.

POL 1373 Pre-Modern Political Thought 4 QH

Presents an analytical and historical examination of the great political thinkers and the main trends of political thought from the Grecian age to the Renaissance. (V) *Prereq.* Junior standing or permission of instructor.

POL 1374 Modern Political Thought 4 QH

Presents an analytical and historical examination of the great political thinkers and the main trends in political thought from the Renaissance to the twentieth century. (V)

POL 1376 American Political Thought 4 QH

Traces the contributions to political theory of the main social, economic, political, intellectual, and philosophic movements in America from the colonial period to the present.

POL 1377 American Political Process 4 QH

Analyzes the American political system, with emphasis on civil liberties. Not open to political science majors or anyone who has taken POL 1111.

POL 1378 Contemporary Political Thought 4 QH

Analyzes current ideals, ideologies, and political movements, including existentialism, neo-Marxism, black power, women's liberation. Examines the decline of ideology and behavioralism.

POL 1379 Marx and Marxism 4 QH
Studies the social and political thought of Karl Marx. Examines the development of Marxian theory after Marx's death. Discusses class struggle, social revolution, and communism. (V)

POL 1380 Governmental Accounting 4 QH
Focuses on basic accounting principles and methods used by government agencies, including the utilization and interpretation of financial statements, auditing, and the application of electronic data processing in government record keeping. (Public Administration elective.) *Prereq.* POL 126L.

POL 1382 Intergovernmental Relations 4 QH
Analyzes the relationships among national, state, and local levels of government in the United States and the changing patterns of those relationships.

POL 1384 Arab-Israeli Conflict 4 QH
The Arab-Israeli confrontation has its own dynamics, and its nature has changed through the decades. This course analyzes its effects on the internal politics of the Arab states and Israel, Pan-Arab politics, and the role of the great powers in the region. (VI)

POL 1385 Housing and Community Development 4 QH
Traces historical metropolitan growth patterns and the influence of public policy on the development of American cities. Discusses topics such as urban renewal, suburbanization of low- and moderate-income housing, and new communities. (Public Administration elective.)

POL 1386 International Law 4 QH
Focuses on territory and jurisdiction of states, treaties, recognition, peaceful settlement of disputes, resort to force. *Prereq.* POL 1112.

POL 1388 Political Polling and Survey Research 4 QH
Examines the entire survey research process, which is the most common approach to program evaluation survey design, sampling, questionnaire design, survey administration, data processing, and data analysis. Also involves some statistical analysis. *Prereq.* POL 1301.

POL 1389 American National Security Policy 4 QH
Traces the evolution of American national security policy in the post-World War II period. Considers American nuclear military policy and conventional non-nuclear military policy. Explores arms control policy.

POL 1410 Seminar in American Government 4 QH
Offers an in-depth study of selected topics in American government. *Prereq.* Senior political science major and permission of instructor.

POL 1411 Seminar in International Relations 4 QH
Offers an in-depth study of selected topics in international relations. *Prereq.* Senior political science major and permission of instructor.

POL 1412 Seminar in Comparative Politics 4 QH
Offers an in-depth study of selected topics in comparative politics. *Prereq.* Senior political science major and permission of instructor.

POL 1413 Senior Seminar in Political Science 4 QH
Offers an in-depth study of selected topics in political science. *Prereq.* Senior political science major.

POL 1415 Seminar in Public Law and Social Issues 4 QH
Uses legal writings and recent court cases to examine some of the continuing and perplexing social problems. Discusses issues such as abortion, euthanasia, family planning, criticism of public officials, political activism, the right of privacy, obscenity, racial and economic discrimination. *Prereq.* Junior or senior standing and permission of instructor.

POL 1710 Introduction to Politics (Honors) 4 QH
Honors equivalent of POL 1110.

POL 1711 Introduction to American Government (Honors) 4 QH
Honors equivalent of POL 1111.

POL 1712 Introduction to International Relations (Honors) 4 QH
Honors equivalent of POL 1112.

POL 1800, POL 1801, POL 1802 4 QH each
Directed Study
Offers independent work on chosen topics under the direction of members of the department. *Prereq.* Junior or senior standing and permission of instructor.

POL 1803 Internship in Politics 4 QH
With department approval, students engage in a political or governmental internship under the supervision of a faculty member. Junior or senior status normally required.

POL 1804 Practicum In Lobbying 4 QH
Offers fieldwork opportunity for students to become involved in supervised lobbying activity on the national or state levels of politics. (May be taken only once for academic credit.) *Prereq.* Middled, junior, or senior standing.

POL 1806 Political Science Honors Program Minicourse 1 QH
Deals with specialized topics in political theory.

POL 1807, POL 1808, POL 1809, PL 1810 4 QH each
Junior/Senior Honors Program
For details contact the Honors Office, 183 Holmes.

Psychology

Some courses in the College of Arts and Sciences are duplicated in different departments or colleges or within a department. You may not receive credit for two such courses. If you have a question about whether one course overlaps another, please consult the departments involved and the Office of the Dean before taking the course.

Numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 2.

For additional information concerning psychology department programs and course scheduling, inquire at the main office of the Department of Psychology, 125 Nightingale Hall, 617-437-3076.

PSY 1110 Perspectives in Psychology I 4 QH

Surveys the fundamental principles and issues of the major areas of contemporary scientific psychology. Approaches the study of psychology as a method of inquiry as well as a body of knowledge. Emphasizes biological bases of behavior, principles of learning and motivation, psychological testing, personality dynamics, psychopathology, and therapeutic approaches. (Overlaps PSY 1111.) (II)

PSY 1111 Foundations of Psychology I 4 QH

Surveys the fundamental principles and issues of the major areas of contemporary scientific psychology. Approaches the study of psychology as a method of inquiry as well as a body of knowledge. Emphasizes biological bases of behavior, principles of learning and motivation, psychological testing, personality dynamics, psychopathology, and therapeutic approaches. (Overlaps PSY 1110.)

PSY 1112 Foundations of Psychology 2 4 QH

Continues PSY 1111, emphasizing the areas of lifespan development, sensory and perceptual processes, states of consciousness, cognition, language, memory, emotion, and social influences on behavior. (Overlaps PSY 1113.) *Prereq.* PSY 1110 or PSY 1111.

PSY 1113 Perspectives in Psychology 2 4 QH

Continues PSY 1110, emphasizing the areas of lifespan development, sensory and perceptual processes, states of consciousness, cognition, language, memory, emotion, and social influences on behavior. (Overlaps PSY 1112.) (II) *Prereq.* PSY 1110 or PSY 1111.

PSY 1211 Statistics in Behavioral Science I 4 QH

Introduces descriptive statistics (scales of measurement, frequency distribution and graphs, measures of central tendency, dispersion and correlation, standard scores, and the unit normal curve) and probability theory (permutations, combinations, and the binomial theorem). *Prereq.* MTH 1101 or MTH 1107.

PSY 1212 Statistics in Behavioral Science 2 4 QH

Offers a general presentation of hypothesis testing, including parametric and nonparametric tests, with emphasis on formulating hypotheses and choosing appropriate scales of measurement, tests, and confidence levels. *Prereq.* PSY 1211.

PSY 1214 Psychological Testing: Science and Politics 4 QH

Focuses on the origins of the intelligence testing movement and its relation to eugenics and to behavior

genetics. Covers history, methods, substantive findings, and social implications of psychological measurement and testing. Beginning with the extensive research literature on IQ testing, examines the "nature/nurture" problem in such areas as psychopathology, criminality, and alcoholism. *Prereq.* *Permission of instructor.*

PSY 1215 Sexual Behavior 4 QH

Focuses on the sexual activities of the human male and female from infancy to adulthood. Considers the importance of sexual factors in the life history of the individual, statistical surveys of sexual behavior, and direct observational measures of sexual responding. Explores the nature of love, responses to pornography, prostitution, bisexuality, male and female homosexuality, rape, child abuse, and sexual therapy.

PSY 1218 Psychology of Women 4 QH

Introduces the student with little or no background in psychology to the current theories and research on the psychology of women. Critically examines psychological, biological, and social influences on gender differences, gender roles, and gender stereotypes in the light of scientific evidence and individual experience. Assesses their consequences for society. Uses the unique perspective generated in the field of the psychology of women to evaluate traditional research methods in psychology as well as the major psychological theories formulated to explain women and the differences between women and men. Emphasizes critical-thinking skills.

PSY 1231 Learning and Motivation I 4 QH

Offers an introduction to the basic learning and motivational principles that permit humans and animals to adapt effectively to a changing environment. Emphasizes research and theories of operant and Pavlovian conditioning, with discussions of discriminations and generalization, avoidance and punishment, acquired motivational states (for example, addiction), concept formation, biological constraints on learning and behavior, animal cognition, and other related topics. Relates learning and motivational principles to the understanding and treatment of behavioral, affective, cognitive, and motivational disorders. *Prereq.* PSY 1112 or PSY 1113.

PSY 1241 Human Behavioral Development I 4 QH

Examines the change in behavioral processes from conception up to, but not including, adolescence. Studies biological bases of behavioral development

and the development of motor control, sensation, perception, cognition, language, emotion, personality, and socialization. Examines major theories of development and child-rearing practices. *Prereq.* PSY 1112 or PSY 1113.

PSY 1242 Human Behavioral Development 2 4 QH

Continues the examination of behavioral change from adolescence to death. Examines biological, cognitive, moral, personality, and social processes. Assesses different methods of study and theories of adult development. *Prereq.* PSY 1241.

PSY 1243 Infant Development 4 QH

Focuses on the fact that during the first two years of life, the basic physical perceptual, cognitive and emotional capacities emerge and interact in the development of such complex behaviors as visually guided movement, the formation of social attachments, and the emergence of language. Provides an introduction to this critical period of human development; emphasizes how the infant's biological inheritance interacts with the physical and social environment in the generation of these important abilities and behaviors. *Prereq.* PSY 1241 or ED 1102.

PSY 1251 Food, Behavior, and Eating Disorders 4 QH

Investigates what starts and stops eating behavior. Examines taste, nutrition, metabolism, the brain, food experiences, and societal factors that control feeding behavior. Emphasizes the biological/psychological interaction in normal eating and in pathological eating, such as anorexia, bulimia, and extreme obesity.

PSY 1261 Bilingualism 4 QH

Focuses on the fact that half of the world's population is bilingual, that is, uses two or more languages on a regular basis. Also explores the fact that bilingualism remains a poorly understood phenomenon surrounded by a number of myths, those that hold that bilinguals are found in bilingual countries and are equally fluent in their languages, that bilingual children suffer from cognitive impoverishment; bilingual education hinders the assimilation of minority groups. Reviews all aspects of bilingualism (in the world, in society, in the child and the adult); discusses topics such as biculturalism and language change.

PSY 1262 Language and Cognition 4 QH

Provides a basic introduction to human cognition (cognitive psychology) and the psychology of language (psycholinguistics). On the subject of cognition, emphasizes the mental processes involved in the acquisition, organization, and use of knowledge, including pattern recognition and memory. On the subject of psycholinguistics, focuses on the nature and structure of language, various theories of human production and perception of language, and related experimental findings. *Prereq.* PSY 1112 or PSY 1113.

PSY 1263 Nonverbal Communication 4 QH

Examines the messages we send by posture, facial expression, gesture, gait, and interpersonal distance. Also explores how power, status, and gender affect

nonverbal communication. *Prereq.* PSY 1112 or PSY 1113.

PSY 1264 Animal Communication 4 QH

Examines and compares the communication systems used by animals such as birds, bees, whales, dolphins, and the primates, including chimps and humans. From the four perspectives of biology, linguistics, psychology, and sociology, studies recent attempts to teach other primates some of our languages (sign language, speech, manipulation of tokens or computers); discusses what it means to be a human in the animal kingdom.

PSY 1271 Social Psychology 4 QH

Provides an introductory survey of social psychology. Focuses on aggression, attribution, attitude formation, change, measurement, conformity, impression formation, group processes (social facilitation, deindividuation, for example). *Prereq.* PSY 1112, PSY 1113, or permission of instructor.

PSY 1272 Personality 1 4 QH

Offers a systematic study of the normal personality and its development. Focuses on behavioral, dynamic, and constitutional determinants, assessment of personality, research; surveys the major theories of personality. *Prereq.* PSY 1112 or PSY 1113.

PSY 1273 Personality 2 4 QH

Continues PSY 1272. *Prereq.* PSY 1272.

PSY 1274 Psychology and the Law 4 QH

Traces the effects of psychological factors through the course of a trial, including such issues as accuracy of eyewitness identification, plea bargaining, jury selection, persuasion tactics in the courtroom, presumption of innocence, jury size, jury decision rules, and sentencing and punishment.

PSY 1351 Neuropsychology 1 4 QH

Focuses on the relation between brain function and human behavior. Examines how nerve cells function individually and work together both in small networks and in the nervous system; the structure of the nervous system; how our sense organs provide the nervous system with information about the outside world; how the brain controls movement; and how psychological concepts from motivation to language and memory are represented in the brain. *Prereq.* PSY 1112, PSY 1113, or permission of instructor.

PSY 1352 Neuropsychology 2 4 QH

Continues PSY 1351. Focuses on the relation between brain function and more complex behavior. Examines the multiple kinds of sensory information and the neuronal and hormonal control systems involved in eating, drinking, and sexual and reproductive behavior; how brain activity is related to emotion, sleep, wakefulness, and memory; disorders of behavior and of the brain. *Prereq.* PSY 1351.

PSY 1353 Comparative Psychology and Ethology 4 QH

Surveys animal behavior in a wide range of species (reptiles, birds, fish, and mammals, including humans) to find similarities and differences in the behavioral processes and physiological mechanisms by which individual organisms and species adapt to

their environments. In the first section, focuses on adaptive specializations exhibited by animals in learning about their environments during early development and as adults. In the second section, examines problems of social organizations at the individual level: how animals communicate with each other and transmit "cultural" skills; mechanisms underlying cohesion and dispersal (for example, reproduction and aggression); and the adaptive advantages of being social or asocial. In the final section, provides students with an unusual opportunity to apply concepts and experimental methods they have learned by actually doing a short field study of animal behavior at the Boston Zoological Park. *Prereq.* PSY 1112, PSY 1113, or permission of instructor.

PSY 1361 Introduction to Phonetics 4 QH

Offers an introduction to the nature of the speech signal from articulatory, perceptual, and acoustic points of view. Focuses on sound measurement, sound classes, and a survey and comparison of speech sounds used in languages in the world. Studies stress, tone, and intonation. Examines phonetic classification and transcription of speech as practical tools for students of languages, linguistics, and speech and hearing science. *Prereq.* PSY 1262 or permission of instructor.

PSY 1362 Child Language 4 QH

Examines how language develops in children. *Prereq.* PSY 1262, linguistics, or permission of instructor.

PSY 1363 Linguistics of American Sign Language 4 QH

Offers students an introduction to basic issues in linguistics through examination of the structural properties of American Sign Language and its comparison with other languages having similar properties. Covers phonology (formational properties of signs), morphology (word formation rules, derivation, and inflection; complex verbs, classifiers, verb modulations), semantics (the meaning structure of signs), syntax (the structure of the ASL sentence), and discourse and narrative structure (the structure of ASL utterances in terms of old versus new information and the structure of ASL narratives). *Prereq.* ASL 1101 or permission of instructor.

PSY 1364 Cognition 4 QH

Continues PSY 1262. Focuses on cognition and emphasizes the analysis of perception, memory, and learning within an information-processing framework. Also considers selected topics in cognitive development. *Prereq.* PSY 1262.

PSY 1365 Language and the Brain 4 QH

Focuses on linguistic behavior from a neuropsychological viewpoint. Examines models of how the nervous system, and the brain in particular, controls the production, perception, and internal manipulation of language. Considers localization of cerebral functions and hemispheric lateralization; experimental and clinical evidence for functional models; aphasia and other language pathologies; schizophrenic language; evidence from "slips of the tongue"; and the

bilingual brain. Compares speech, sign language, and writing systems. Also discusses interpretation and translation. *Prereq.* PSY 1262 or permission of instructor.

PSY 1373 Abnormal Psychology 1 4 QH

Focuses on the abnormal personality, including a historical survey and a discussion of such issues as anxiety, defense mechanisms, and the criteria of psychopathology. Also examines the symptomatology, etiology, and dynamics of neuroses (hysteria, phobia, obsession, and compulsion) and of psychosomatic disorders. Discusses case histories. *Prereq.* PSY 1112 or PSY 1113.

PSY 1374 Abnormal Psychology 2 4 QH

Offers a survey of psychological and somatic therapies. Examines symptomatology, etiology, dynamics, and therapy of psychoses (schizophrenia, paranoia, mania, depression). Also discusses sociopathic and organic disorders. *Prereq.* PSY 1373.

PSY 1381 Sensation 4 QH

Provides an introduction to the study of our senses, with emphasis on hearing, touch, taste, and smell. Focuses on how we measure our sensory abilities and relates findings to the functioning of sensory organs — ears, skin, mouth, and nose — and of the sensory nervous system. *Prereq.* PSY 1112 or PSY 1113; PSY 1351 is highly recommended.

PSY 1382 Perception 4 QH

Offers a study of our awareness of the world around us, exemplified primarily by visual perception. Covers light, visual sensory mechanisms, color vision, illusions, consciousness, and dreams. *Prereq.* PSY 1112 or PSY 1113; PSY 1351 is highly recommended.

PSY 1431 Behavior Therapies 4 QH

Offers a study of successful projects that have provided effective remediation and rehabilitation in institutions for the mentally ill, the mentally retarded, and the developing human (schools). *Prereq.* PSY 1112 or PSY 1113.

Directed Studies—Honors Courses

PSY 1710 Perspectives in Psychology 1 (Honors) 4 QH

Honors equivalent of PSY 1110.

PSY 1713 Perspectives in Psychology 2 (Honors) 4 QH

Honors equivalent of PSY 1113.

PSY 1770 Honors Directed Study 4 QH

For details contact the undergraduate coordinator in the psychology department, 125 Nightingale Hall.

PSY 1890, PSY 1891, PSY 1892, PSY 1893, PSY 1894 Directed Study QH each

This course offers independent work under the direction of the psychology department, usually in a research project in one of the department labs. Faculty members normally require completion of advanced lab courses in the area of research interest, but this is a matter of individual discussion. Students interested in directed study should consult a departmental adviser. *Prereq.* Permission of instructor.

PSY 1895, PSY 1896, PSY 1897, PSY 1898, PSY 1899 Junior/Senior Honors Program 4 QH each

For details contact the Honors Office, 183 Holmes.

Laboratories

PSY 1511 Experimental Design in Psychology 4 QH

Focuses on the experimental method in the design, execution, analysis, and reporting of psychological investigations of humans and animals. Lab fee. *Prereq.* PSY 1112 or PSY 1113 and PSY 1212.

PSY 1530 Experiments in Learning and Motivation 4 QH

Gives students the opportunity to assess the generality, specificity, and robustness of learning and motivational principles through human laboratory studies and field experiments with free-ranging feral animals. Involves designing and conducting experiments and writing reports on operant and Pavlovian conditioning, adjunctive behavior, biofeedback, concept formation, and related topics. Focuses on the theoretical and clinical implications of experimental findings. This course does not use laboratory animals. *Prereq.* PSY 1231 and PSY 1211.

PSY 1531 Learning and Motivation Laboratory 4 QH

Gives students the opportunity to gain proficiency, through direct experience, in lab analysis of behavior and in evaluating common generalizations about human behavior. Expects students to design and perform experiments in animal and human learning, memory, decision processes, concept formation, and other topics of individual interest. Lab fee. *Prereq.* PSY 1212 and PSY 1231.

PSY 1532 Behavior Modification Laboratory 4 QH

Gives students the opportunity to participate in education and training of severely and profoundly retarded residents at the Walter E. Fernald State School and to apply learning theory principles to teaching new skills and to treating inappropriate behavior. Also provides students the opportunity to write individual and group training programs, implement them in a classroom setting, and learn methods for evaluating program success. *Prereq.* PSY 1531 or PSY 1351, and permission of instructor.

PSY 1551 Laboratory in Neuropsychology 4 QH

Students conduct three separate research projects, of which the first two will use rats and the third will use humans as subjects. The three projects investigate the effects of intracranial electrical stimulation of reward systems in the rat brain; electroencephalogram (EEG) records of different phases of sleep and lateralization of function between the left and right cerebral hemispheres. Students carry out all the phases of experimentation, including surgery, behavioral tests, frozen sections and staining of brain tissue in preparation for histological examination of electrode placements, and data analyses. This course ends with oral presentations by students of their research findings. Lab fee. *Prereq.* PSY 1651, PSY 1351, or permission of instructor.

PSY 1562 Laboratory in Psycholinguistics 4 QH

Provides students the opportunity to acquire first-hand experience in conducting research on problems in the psychology of language. Involves students in all aspects of each experiment, including collecting and analyzing data and preparing reports. Focuses on the particular experiments conducted and the implications of the experimental findings for broader issues in the psychology of language. Lab fee. *Prereq.* PSY 1211 and PSY 1262.

PSY 1564 Cognition Laboratory 4 QH

Focuses on experiments related to topics in PSY 1262 and PSY 1364. Lab fee. *Prereq.* PSY 1212 and PSY 1262.

PSY 1571 Laboratory in Social Psychology 4 QH

Provides an introduction to the methods of social-psychological research. Assists students in developing the ability to read published social research with a critical eye, to pose questions in a testable manner, to apply experimental methods to social research, and to express themselves in APA-journal style. Lab fee. *Prereq.* PSY 1212 and PSY 1271.

PSY 1572 Personality Laboratory 4 QH

Provides an introduction to the methods and areas of personality research. Discusses problems of measurement, control, and interpretation. Critically examines representative published experiments. Expects students to design, collect data for, assess, and write up several experiments, including one original research project. Lab fee. *Prereq.* PSY 1212 and PSY 1272.

PSY 1581 Sensation and Perception Laboratory 4 QH

Focuses on experiments involving precise measurements of both physical and psychophysical phenomena, including auditory function, color vision and after-effects, muscular sensation, tactile sensitivity, and adaptation to perceptual distortions. Lab fee. *Prereq.* PSY 1212 and PSY 1381 or PSY 1382.

Seminars

PSY 1632 Seminar in Behavior Modification 4 QH

Discusses topics in behavior modification in a seminar format. *Prereq.* PSY 1231, PSY 1531, or permission of instructor.

PSY 1651 Seminar in Neuropsychology 4 QH

Offers intensive study, discussion, and practice in lab studies of physiological variables. Covers evolution of the nervous system, sensory and motor mechanisms, motivation and emotion, sleep, attention and perception, learning, and memory. *Prereq.* PSY 1351 or permission of instructor.

PSY 1652 Sensory Physiology Seminar 4 QH

Concentrates on the psychophysiology of various sensory systems, vision and hearing in particular. Discusses the problem of accounting for sensory phenomena in terms of physiological concepts. *Prereq.* PSY 1351.

PSY 1661 Seminar in Psycholinguistics 4 QH

Focuses on the on-line processing of language. Discusses recent research in light of such questions as, While listening to someone speak, how does the listener process the information carried by the acoustic signal? What is the role of linguistic rules, prediction strategies, and contextual information? And when speaking, what processing stages are involved from the moment the speaker decides to speak to the moment the articulators start functioning? Examines these and other questions, as well as experimental techniques and current trends in psycholinguistics. *Prereq.* PSY 1262 or permission of instructor.

PSY 1662 Seminar in Cognition 4 QH

Varies in subject matter by term. *Prereq.* PSY 1262.

PSY 1671 Seminar in Social Psychology 4 QH

Expects students to examine and present in class their findings on a particular topic in social psychol-

ogy, for example, attribution, aggression, conformity, attitude-behavior relationship. *Prereq.* PSY 1271 or permission of instructor.

PSY 1672 Seminar in Clinical Psychology and Personality 4 QH

Offers seminar presentations of topics relevant to understanding the normal and disturbed personality. Covers topics such as specialized assessment procedures, cognitive styles in personality, temperament, hypnosis, anxiety, aggression, specialized clinical syndromes, and the development of conscience. *Prereq.* PSY 1373 or permission of instructor.

PSY 1681 Seminar in Sensation and Perception 4 QH

Prereq. PSY 1381, PSY 1382, or permission of instructor.

Anthropology

Some courses in the College of Arts and Sciences are duplicated in different departments or colleges or within a department. You may not receive credit for two such courses. If you have a question about whether one course overlaps another, please consult the departments involved and the Office of the Dean before taking the course.

Numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 2.

SOA 1100 Peoples and Cultures 4 QH

Surveys concepts in anthropology (the study of culture). Analyzes a range of societies in terms of such sociocultural institutions as kinship, gender relations, economics, politics, and religion. Examines important political and economic processes, such as colonialism and development, affecting cultures around the world.

SOA 1101 Cultural Meaning and Everyday Life 4 QH

Using anthropological ideas, studies the underlying patterns of meaning that are below the surface of everyday thought and behavior. Examines daily routines, leisure activities, joking and humor, speech patterns, popular culture, current folklore and mythology, nonmonetary economic transactions, kinship and friendship, and religion and ritual.

SOA 1104 Cultures of the World 4 QH

Introduces the student to societies around the globe. Intensively examines a number of societies analyzes the factors enabling cultures to develop their unique patterns. Emphasizes developing the ability to compare and contrast societies in a controlled and valid way, as well as looking at societies in a constant attempt to adapt to changing environments. (II)

SOA 1120 Camera on Culture: Visual Anthropology 4 QH

Explores how cultures are portrayed on film. Examines anthropologists' use of film to gather information and represent other peoples. Also examines how filmmakers from postcolonial societies have addressed the respective cultures, the experience of colonialism, and the nature of filmmaking and

film/video consumption in the third world. When possible, offers a production experience is included. (IV)

SOA 1125 Introduction to Archaeology 4 QH

Traces the history of archaeology, focusing intensively on key sites in the new and old worlds. Uses film and slides of sites and artifacts extensively.

SOA 1146 Peasants: Community, Culture and Rebellion 4 QH

Provides students with an understanding of peasant societies in the third world today. Outlines classic peasant studies, but focuses on the relationship between peasant communities and class formation, and peasant organizing efforts on issues such as land reform. Examines the gender division of labor, peasant households, peasant ceremonial life. Uses case studies on Latin America, but also includes examples from other areas. (IV)

SOA 1155 Individual and Culture 4 QH

Explores the ways in which individuals are shaped by society and the ways in which they can effect change.

SOA 1160 Sex, Sex Roles, and Family 4 QH

Examines popular and scientific notions about sex, gender relations, family, and kinship. Examines why our images of family, masculinity, and femininity are not universal by analyzing the patterns of sex roles, sexual practices, and kinship in other cultures. Discusses how and why relations between men and women change during times of socioeconomic and political change.

SOA 1185 War and Aggression 4 QH

Using anthropological investigations, critically evaluates the assumption that aggression is part of human nature and linked to sex differences. Discusses cross-cultural variation in violent behavior and warfare in the context of wider political and economic processes. Analyzes the widespread belief in innate masculine aggression as it relates to contemporary societal violence and militarism.

SOA 1220 Culture and Mental Illness 4 QH

Discusses and analyzes the nature and meaning of culture, the role of culture in personality formation, culture and anxiety, anthropological approaches to the "normal" and the "abnormal," and the question "Is mental illness psychological fact or cultural fiction?"

SOA 1255 Sport in Society 4 QH

For course description, see SOC 1255.

SOA 1267 The Anthropological Study of Myth 4 QH

Focuses on theories concerning the nature and meaning of myth. Explores the function of myth in social and cultural change. Covers the structural analysis of myth.

SOA 1275 Musical Culture: Notes in the Modern World 4 QH

The ongoing social, political, and cultural dialogues reflect the people who compose, play, and listen to music. This course explores issues of class, ethnicity, gender, sexuality, and age in the cross-cultural context of music as expressed in performances, recordings, videos, literary, and ethnographic materials. The course will also examine the social production and consumption of music. Expects students to conduct a series of field exercises.

SOA 1301 Human Origins 4 QH

Offers an intensive look at the data on fossil remains and contemporary primates, which are essential for an understanding of human physical and behavioral evolution. Efforts are made to bring the student into direct contact with primary materials. (II)

SOA 1303 Sexuality and Culture 4 QH

Examines sexuality in a cross-cultural perspective including issues of sexual identity, the relationship of sexuality to the life cycle, sexual ideologies, and the links between sexuality and the reproduction of cultural norms. Topics include cross-cultural variation in sexual expression, sex and reproduction as commodities, sexuality and violence, sexually transmitted diseases and social policy. Compares sexuality issues in the United States to those of other cultures.

SOA 1310 Global Markets and Local Cultures 4 QH

Discusses selected topics in the socioeconomic transformation of other cultures, including urbanization, industrialization, commodity production, and international labor migration. Focuses on the impact of capitalist development on contemporary third world and postcolonial societies; examines local responses to those changes.

SOA 1320 Anthropology Methods 4 QH

Examines theory and practice of methods of field research and data analysis. Gives students the opportunity to take part in a field project.

SOA 1335 Language and Communication 4 QH

Focuses on the anthropological study of linguistics. Presents basic theories of sociolinguistics and explores language in its social context. Includes animal communication; language learning; language and mind; cognitive and symbolic anthropology; the ethnography of speaking, speech, and boundaries; multilingualism; language and gender; language and ethnicity; language and social class; and pidgins and Creoles. Includes several field assignments.

SOA 1345 People in Cities 4 QH

Studies urban life and urban problems, using international case studies. Addresses rural/urban and international migration, the relationship of urban settlement to employment patterns, the creation of inner-city or suburban ghettos or squatter settlements, and movements for city services in areas of spontaneous growth. Gives students the chance to design and implement a field project.

SOA 1356 The Anthropology of Law and Conflict 4 QH

Examines settling disputes in stateless societies, forms and mechanisms of social control, law as an indicator of cultural and social norms, the study of conflict resolution as an ethnographic tool. Requires some field research and analysis.

SOA 1360 Economic Anthropology 4 QH

Examines types of economic systems in simple societies: reciprocal, redistributive, market exchange; economic relations as part of social relations; land-tenure systems, credit systems, savings mechanisms. Analyzes the transition from subsistence to cash economics.

SOA 1420 Kinship and Society 4 QH

Offers study for the advanced student only. Studies a variety of kinship systems, their terminological and structural components, and the way in which they articulate with other social institutions.

SOA 1425 Cultural Survival 4 QH

Examines the problems faced by today's tribal peoples and national minorities. Using cross-cultural case studies, analyzes the relationship of governmental policies and economic development priorities to the survival of self-identified tribal cultures and minority populations throughout the world. Examines human rights, nationalism, and cultural autonomy, resistance, and self-determination.

SOA 1430, SOA 1431, SOA 1432, SOA 1433, SOA 1434, SOA 1435 4 QH each

Area studies courses, including Latin America, the Caribbean, Africa, China/East Asia, India/South Asia, Southeast Asia, Mediterranean, Eastern Europe, that are offered as the department's resources permit.

SOA 1430 Latin American Society and Development 4 QH

Explores the processes of social, economic, and cultural change in Latin America. While concentrating on the present, traces class formation, agrarian structures, ethnic identity, ceremonial organization, gender roles, and political conflict since the colonial era in a range of countries. Emphasizes the relationship of communities and national political and economic systems. May emphasize Central America and Mexico or countries in South America through case studies.

SOA 1434 Contemporary Japanese Society and Culture 4 QH

See SOC 1104 for course description.

SOA 1470 Religion and Myth 4 QH

Focuses on nature and institutionalization of primitive, ancient, and contemporary religions. Explores religious concepts and movements in relation to social, religious, and political organization.

SOA 1704 Cultures of the World (Honors) 4 QH

Honors equivalent of SOA 1104.

SOA 1800, SOA 1801 Directed Study 4 QH

Offers independent work on a chosen topic under the direction of members of the department. Limited to

qualified seniors with approval of the department chair. *Prereq.* Department approval.

SOA 1820, SOA 1821, SOA 1822, SOA 1823 4 QH each**Junior/Senior Honors Program**

For details contact the Honors Office, 183 Holmes.

SOA 3100 Theory 4 QH

Qualified undergraduates can take this graduate school course, with permission of instructor.

INT 1340 Cultural Aspects of International Business 4 QH

Using a managerial perspective, covers issues that arise when a firm moves from its home country to a host country that may have a different national culture. Usually assumes the perspective of the United States-based firm that operates abroad, but spends some time on what happens to other national firms operating in the United States and in third-country environments. Analyzes the way in which "corporate culture" evolves, in the context of national culture and the impact on managers. *Prereq.* *Middler standing.*

Sociology

SOC 1100 Introduction to Sociology 4 QH

Explores basic concepts and theories concerning the relation between individuals and society. Emphasizes the influence of culture, social structure, and institutions in explaining human activity. Discusses and analyzes social groups, socialization, community, class, power, and social change, among other substantive issues.

SOC 1101 The Sociology of Everyday Life 4 QH

Examines the development, application, and consequences of rules for everyday activities (for example, walking, talking, eating, drinking, sitting, smoking, laughing, crying, and sleeping). Considers the effects of artifacts, culture, space, and territory on these activities, on social life, and on the expression of emotions.

SOC 1102 Social Inequality and Communication 4 QH

Analyzes the ways in which groups and institutions, in both their ritual and everyday activities, communicate the idea of hierarchy and an individual's place in it through face-to-face interaction, formal communication, and the use of space and time. Takes a dramaturgical approach to social organization, with special emphasis on status images in the media and the communication of social place by service organizations and professional groups. Includes some content analysis and observational fieldwork.

SOC 1103 American Society 4 QH

Focuses on American society, culture, and major social institutions: economic, religious, governmental, familial, educational, welfare, and recreational.

Examines social classes and stratification, mobility, and individualism. *Prereq.* *SOC 1100 or equiv.*

SOC 1104 Contemporary Japanese Culture and Society 4 QH

Focuses on contemporary Japanese urban society. Examines major values, family structure, sex roles, social control, the economy and the division of labor, mass media, religion, arts, and social problems. (See SOA 1434.) (IV)

SOC 1110 Society and Culture in the Soviet Union 4 QH

Focuses on contemporary Soviet society. Emphasizes the social, economic, and political reforms of the Gorbachev period and the ways in which the Soviet Union has evolved since 1917.

SOC 1120 Sociology of Boston 4 QH

Examines Boston from the perspectives of environmental development, neighborhood and intergroup relations, institutional services, and symbolic meanings. Explores current issues in the city through term projects. Requires field trips. *Does not meet elective requirement for sociology/anthropology major.*

SOC 1121 Doing Sociology 4 QH

Takes a research approach to sociology. Focuses on students' participation in their own learning about sociology as a body of knowledge and as a method of studying social life. Requires students to use the computer during the course. (II)

SOC 1125 Social Problems 4 QH

Analyzes five major sociological perspectives on social problems (pathology, disorganization, value conflict, deviance, and labeling). Examines the

conditions under which certain recurrent events, activities, and persons become redefined as social problems (for example, mine disasters, marijuana smoking, and alcoholism). Studies the typical responses to social problems and their consequences.

SOC 1135 Social Psychology 4 QH

Offers a sociopsychological approach to individual behavior in social contexts. Introduces basic concepts, such as socialization, identity, self-concept, role conflict, attitudes and attitude measurement, and groups and group processes. Surveys major theoretical orientations and important substantive topics.

SOC 1140 Sociology of Prejudice 4 QH

Examines factors in the development and maintenance of prejudice and discrimination. Discusses American race relations, anti-Semitism, sex roles, and stereotyping.

SOC 1145 Population and Society 4 QH

Examines traditional and contemporary approaches to human population and its control. Considers factors affecting birth and death rates; societal implications of population quantity and quality in several situations, past and present; rural-urban migration and mobility; racial, genetic, stratificational components for population analysis. Discusses public policies and responses to fertility control in several societies. Studies international efforts to understand and generate action on population issues. (VI)

SOC 1146 Environment and Society 4 QH

Examines the political economy of the global environmental crisis. Topics vary from quarter to quarter and include such issues as world resource availability, energy, pollution, ecological degradation in the Third World, environmental policy, and social movements. Involves practical experience in environmental problem solving. (VI)

SOC 1147 Cities and Society 4 QH

Focuses on the foundations of urban life in historical perspective. Analyzes relation of city life to environment, population, social organization, technology and cultural values. Examines growth trends, urbanization, urban planning, and citizen action. (Formerly Urban Society).

SOC 1150 Introduction to Women's Studies: Image, Myth, and Reality 4 QH

See INT 1150 for course description.

SOC 1155 Sociology of the Family 4 QH

Focuses on the family as a social institution in several selected cultures; interrelations of the family and political, economic, and educational institutions; social nature of personality; role taking; individualism, mobility, and industrialism. (V)

SOC 1156 Violence in the Family 4 QH

Examines physical, emotional, and sexual violence in families, with emphasis on child, sexual, and spouse abuse. Covers definitions, prevalence, causes, prevention, and treatment of specific cases of domestic violence. Focuses on social policy issues and problems of legal intervention in cultural and family issues.

SOC 1160 Sex-Gender Roles in a Changing Society 4 QH

Reviews and applies theories about the determinants of sex statuses and roles from historical and cross-cultural perspectives. Focuses on women's status in different institutions of American society.

SOC 1165 Students, Schools, and Society 4 QH

Emphasizes the role of education in processes of socialization, social mobility, social control, and social change. Do social characteristics (sex, race, class, age, physical status) influence the school experience? Do schools provide opportunity and initiate change, or do they perpetuate the status quo in economic, political, and social life? Who goes to school, where, for how long, and with what result? How does educational advantage or disadvantage get translated into jobs and social status? Encourages students to draw on their own experiences to develop paper topics.

SOC 1168 The Social Movements of the 1960s 4 QH

Considers the social and cultural movements of the 1960s and their origins in the Civil Rights movement. Examines the opposition to government policies and social norms that developed into the Civil Rights, student, New Left, antiwar, countercultural, and women's movements in order to understand their grievances, goals, composition, and impact.

SOC 1170 Race and Ethnic Relations 4 QH

Focuses on racial and religious groups, particularly with reference to the United States. Places special emphasis on historical development, specific problems of adjustment and assimilation, and specific present-day problems and trends. *Prereq.* SOC 1100 or equiv.

SOC 1171 Race and Ethnic Relations: A World Perspective 4 QH

Offers a cross-cultural analysis of race and ethnic relations in Western and non-Western societies. Examines race and ethnic relations in terms of contemporary developments, world problems, and ideological conflicts. (Formerly Comparative Race/Ethnic Relations).

SOC 1175 Sociology of Work 4 QH

Examines the varieties of work in American society, from blue collar to managerial and professional occupations. Considers job dissatisfaction and professional burnout, changing shape of the labor market, women and work, participation and humanization of work, the impact of computers. (VI)

SOC 1176 Sociology of Business/Industry 4 QH

Focuses on the role of industry in modern society. Examines similarities and dissimilarities among industrial societies, bureaucracy and its alternatives, unions, supervision democracy and manipulation, the worker on the assembly line, sabotage of the organization, and the role of wages and alienation.

SOC 1177 Social Roles in the Business World 4 QH

Analyzes the social structure of corporate and business life in contemporary America. Presents and discusses case studies from major accounting and/or industrial firms. Examines the "career line" in the

world of business and management, with a special focus on age/sex, racial/ethnic, and class/income barriers.

SOC 1178 Women Working 4 QH

Discusses the fact that differences in the labor force experience of men and women workers generally go unrecognized, and the work experience most common to women — household work — is rarely analyzed. Covers women's market and nonmarket activities, their rewards, and their problems, in addition to empirical and theoretical analyses of the work roles of women. Overall, underscores the differences between work experiences of men and women.

SOC 1180 Sociological Perspectives on Consumerism and Consumer Behavior 4 QH

Examines consumer-oriented issues, including interest groups, needs, values, institutional networks, decision-making processes, and situational impacts. Explores systemic benefits and costs of consumer-relevant actions.

SOC 1185 The Sociology of Deviance 4 QH

Explores the conditions under which people categorize others as different; processes by which persons so defined are assigned deviant status and assume appropriate roles and self-images; development of deviant careers and their relation to deviant subcultures; situations in which people transform deviant identity. (Formerly Social Deviance.)

SOC 1186 Social Control 4 QH

Examines formation of social bonds and the conditions under which they are ruptured, the emergence of deviance as an interactional problem, and individual and societal reactions to the most prevalent forms of deviant behavior. Analyzes agencies of social control, their definitions of problems, and responses to typical clients.

SOC 1190 Juvenile Delinquency 4 QH

Examines the sociological and psychological approaches to and their implications for a typology of delinquency. Discusses problems of prevention, treatment, and rehabilitation.

SOC 1195 Drugs and Society 4 QH

Offers an introduction to the sociology of drugs. First examines social definitions of drugs, conditions of their use, and socialization into drug use. Then considers deviant drug use and effects of social control on definitions and use. Considers a range of licit and illicit drugs, but gives major emphasis to alcohol, marijuana, and heroin.

SOC 1200 Sociology of Alcoholism 4 QH

Focuses on social responses to deviant alcohol use. Examines drinking cultures and drinking practices in the United States; processes by which people are labeled "alcoholics"; and the role of agencies of social control, such as the criminal justice system and the health care system, in labeling and in rehabilitation.

SOC 1201 Alcohol Use and Social Control 4 QH

Examines the conditions under which alcohol use disrupts social life; the processes through which

alcohol controls, informal and formal, come into being; the development changes and consequences of these controls. Includes case studies of Prohibition, regulation of the alcohol beverage industry, legal drinking age, drinking and driving, and public drunkenness.

SOC 1202 Sociology of Drinking 4 QH

Examines how different groups and societies organize drinking as a social act and the consequences of that organization. Singles out for particular attention the cultural meaning assigned to drinking, the social elements found in all drinking situations, how members of social groups learn how to drink, and the social and psychological functions of drinking.

SOC 1205 Law, Crime, and Social Justice 4 QH

Analyzes the impact of the legal system on the creation and perpetuation of criminality in contemporary American society. Devotes particular attention to the study of the creation of criminal law, the judicial process, and the role of law in the gap between crime and social justice. Arranges field trips to criminal arraignments, trials, and sentencing in the Boston Municipal Court and Suffolk Superior Court. Suitable for students in prelaw, criminal justice, political science, and allied fields.

SOC 1206 Class, Crime, and the Police 4 QH

Summarizes the major psychological, social, biological, economic, and political theories about the cause of crime. Then applies these theories to the daily operations of the police, courts, and prison system in the United States. Examines various attempts to lower the crime rate through such policies as "scared straight" programs, the death penalty, stricter and looser prisons, increased police presence, and behavioral conditioning.

SOC 1215 Medical Sociology 4 QH

Examines the professions, training, institutions, and problems in health care, with an emphasis on those in the United States. Considers practical issues in the improvement of health care systems. *Prereq.* SOC 1100 or permission of instructor.

SOC 1216 Health Care as a Social Issue 4 QH

Explores the social and political dynamics of health care: who benefits from the system and defends it, who works for change, who wins and why. Examines the social history of health care, occupational politics, community power structure and the health care setting, the planning and delivery of health services to "haves" and "have-nots," and the role of citizens in determining the future of health care through activism, lobbying, legislation, and participation in controlling the system. Provides case examples. *Prereq.* SOC 1100 or permission of instructor.

SOC 1217 Women, Health, and Social Change 4 QH

Examines how women have traditionally been viewed by the medical field and how reproduction and childbirth came to be defined as medical problems. Also examines the implications for women in the changes that have taken place in health care,

especially as these pertain to new reproductive frontiers and alternative health care facilities. Discusses the role of women in the health care professions.

SOC 1220 Sociology of Mental Health

4 QH

Surveys sociological perspectives on mental health and mental disorder. Uses discussions, readings, and presentations to explore the social history of mental illness, epidemiology, cross-cultural perspectives, patients' careers, social institutions of treatment, and policy implications. Examines areas of convergence between sociological concepts and psychiatry. *Prereq.* SOC 1100 or *equiv.*

SOC 1225 Aging and Society

4 QH

Surveys issues and questions on aging, with special attention to social and economic consequences of the aging process, including retirement and productivity, health care problems, nursing home residences, widower- and widowhood, and the approach of death. Presents examples relating to aging in other cultures in a search for new answers to social problems of aging in the United States. Gives students the opportunity to learn to anticipate, cope with, and even prevent problems of aging that concern self, family, and clients/patients.

SOC 1235 Death and Dying

4 QH

Focuses on the treatment of death and dying, including problems faced by health care professionals, family members, institutions, the funeral industry, and the dying themselves. Discusses cross-cultural perspectives, the social distribution of mortality, the changing nature of death, and the ethical problems in determining life and death with particular attention to such issues as abortion, suicide, and ceasing medical intervention. *Prereq.* SOC 1100 or *permission of instructor.*

SOC 1240 Sociology of Human Service Organizations

4 QH

Explores the contradiction between what human service organizations set out to do and what they actually accomplish. Also examines how the goals of human service organizations are defined, how clients become labelled, and the societal constraints on clients, workers, and human service organizations.

SOC 1245 Sociology of Poverty

4 QH

Analyzes American poverty in historical perspective, drawing on comparisons with other countries. Critically evaluates of sociological research and theories relating to poverty. Considers causes and effects of poverty, as well as societal responses to poverty and its consequences. Suitable for students in applied fields, such as nursing, criminal justice, education, allied health, premed, and prelaw.

SOC 1247 Food and Hunger

4 QH

Systematically examines the social causes and consequences of hunger and alternative approaches to solving world hunger.

SOC 1250 The Sociology of Private and Public Assistance

4 QH

Helps students understand why public and private assistance in the United States takes the form it does.

Examines the ideology behind the welfare system, the kinds of assumptions made about the poor, how other countries deal with the problem, the effects of poverty in the United States, and some explanations for its continuing existence.

SOC 1255 Sport in Society

4 QH

Analyzes the social origins and functions of leisure activities, with special emphasis on games and sports as forms of leisure. Gives considerable emphasis to cross-cultural and historical analysis, as well as to the relation between leisure activities and various social institutions—economy, polity, family, and religion. (See SOA 1255.)

SOC 1275 Sociology of the Arts

4 QH

Examines the relation between the social organization of society and the forms of art produced—the social role of the artist, how the arts are “manufactured” and distributed, the art consumer's relation to art and the artist, social support for the arts. Deals with a variety of art forms, with emphasis on the performing arts.

SOC 1276 Sociology of Popular Culture

4 QH

Presents a sociological analysis of popular culture, focusing on the relationship between pop culture and social institutions such as religion, the law, education, the economy, and the family; the organizations and artistic communities that produce pop culture such as the music industry, theatrical groups, advertising agencies; and the social roles and socialization processes associated with individual artists. Examines changes in popular culture from the viewpoint of changes in the larger society.

SOC 1284 Technology and Careers of the Future

4 QH

Focuses on new technologies and their social impacts on work and careers in the future. Examines sociological and humanistic approaches to technical change in the shop floor, offices, and professions. Also covers issues of design and control, health, employment, and autonomy.

SOC 1285 Technology and Society

4 QH

Discusses the following questions: Does society control technology or is technology directing society? Has technology become dehumanized? How valid is the doctrine of technological inevitability? Can the technological “fix” be viewed as a solution to social problems? Is technology itself a social problem? What can be expected of technology assessment? What of the back-to-nature and antitechnology movements today: are they the waves of the future? Expects students to do considerable independent study and research.

SOC 1286 Science and Society

4 QH

Recognizes that science has had profound effects on our society, and scientists have seen the ways in which political, economic, and social forces have guided developments in their fields. Explores issues such as “responsibility” and “autonomy” created by this interdependence. Emphasizes the social structures within which science operates and is communicated and science as an occupation and profession,

as well as a system of thought and set of tools for producing knowledge.

SOC 1287 Society Tomorrow: Forecasting Alternative Futures 4 QH

Introduces students to the area of "social futures" or "future studies." Examines the major techniques used to forecast futures and the specific scenarios and projections about the social world of tomorrow. Using the areas of energy and resources, robotics and the "information revolution," as well as modern weaponry and warfare, considers the major prospects and problems for society in the future.

SOC 1290 Military and American Society in a Nuclear Age 4 QH

Acknowledges that keeping out of war, winning war, and keeping peace have been major concerns during the past forty-five years. Investigates the relationship between military and society. Covers selected issues, including the impact of the military on social institutions such as the family, polity, and economy, the arms race and upheaval in social life, the legitimization crisis of the United States military, the role of women and minorities as reserve armies, and military spending and domestic social problems.

SOC 1300 Classical Social Thought 4 QH

Traces the development of sociology from the history of social thought. Examines the emergence of several schools, beginning with positivistic organicism and conflict theory. *Prereq.* Three sociology/anthropology courses.

SOC 1301 Current Social Thought 4 QH

Offers a seminar-lecture in which formalism, social behaviorism, social action theory, and functionalism are studied critically. *Prereq.* Three sociology/anthropology courses.

SOC 1302 Female Perspectives on Society 4 QH
(Formerly Feminist Perspectives on Society)

Examines a sampling of the burgeoning feminist literature in the social sciences and in theory, focusing on at least three major tendencies in this literature: radical feminism, socialist feminism, and neo-Freudian feminism. Discusses specific topics, including the origins and/or universality of women's oppression, women's work under capitalism, socialism and women's liberation, and family structure and the reproduction of gender. (VI)

SOC 1310 Class, Power, and Social Change 4 QH

Focuses on theories of social equality and inequality as applied to the exercise of power and large-scale social change. Required of majors. (V) *Prereq.* SOC 1100 and middler standing or permission of instructor.

SOC 1320 Introduction to Statistical Analysis 4 QH

Examines the application of the principles of measurement, probability, measures of centrality, tests of significance, and techniques of association and correlation to social data. *Prereq.* SOC 1100 or permission of instructor.

SOC 1321 Research Methods 1 4 QH

Introduces students to the research process through an examination of the rules of evidence in empirical research and the place of values. Gives students the opportunity to learn how to design and critique types of sociological research, how to collect qualitative and quantitative data, and how to sample populations. *Prereq.* SOC 1100 and SOC 1320, or permission of instructor.

SOC 1322 Research Methods 2 4 QH

Requires students to complete the research project begun in SOC 1321. Focuses on practice coding, building indexes, scaling, table construction; introduction to use of the computer. *Prereq.* SOC 1100, SOC 1320, and SOC 1321, or permission of instructor.

SOC 1323 Qualitative Research Methods 4 QH

Offers an introduction to sociological fieldwork — methods of gathering data by extended observation of and interaction with people in natural settings. Requires students to take part in a series of observations designed to teach the basic skills of open-ended interviewing, observing, recording, and analyzing data. Focuses on the theoretical base, which will be symbolic interaction.

SOC 1324 Human Services Research and Evaluation 4 QH

Covers basic issues in applied research and the evaluation of services, including the purposes of evaluation, ethics, formulating questions and measuring answers, designing evaluations and planning oriented research, utilizing evaluation results, and the turbulent setting of action programs. Suitable for students majoring in human services, sociology, psychology, nursing, health education, and related fields. *Prereq.* SOC 1320 or other statistics, SOC 1240, or permission of instructor.

SOC 1335, SOC 1336 Group Behavior 1, 2 8 QH

(Formerly Group Behavior — The Sociological Imagination)

Explores how individuals interact in groups and how groups interact with each other. Focuses on the reflexive self, social aspects of language, situational learning, group perspectives, careers, institutions, and worlds.

SOC 1337 Seminar in Social Psychology 4 QH

Focuses on the interaction of psychological and group processes. Requires students to read original theoretical and research monographs in the field. Includes such topics as prejudice, reference groups, sex roles, conformity, leadership, aggression, communication, collective behavior, and achievement.

SOC 1345 American Demographics 4 QH

Offers an applied research experience in which students have the opportunity to study the major areas of demography. focuses on the resources of the United States Census Bureau and, in particular, the data products available from recent census surveys.

SOC 1346 Suburb and Metropolis**4 QH**

Explores ecology of suburban and metropolitan growth, impact on center city and rural fringe, emergent lifestyles and institutional forms. Compares interdependence, issues of identity, autonomy, and accessibility. Analyzes different types of metropolitan political, social, and economic institutions. Considers prospects for regional action. *Prereq.* SOC 1100 or equiv.

SOC 1347 Community Analysis**4 QH**

Explores types of human settlements, focusing on the interaction between people and their political, economic, and social environments. Discusses power structure and citizen action to influence institutions; skills in community analysis, including use of documents, survey, observation, and evaluation of needs and resources; strategies of conflict, cooperation, and negotiation to attain community and group ends. *Prereq.* Permission of instructor or three sociology/anthropology courses.

SOC 1348 Seminar in Urban Studies**4 QH**

Compares interdisciplinary approaches to urban studies according to problem areas and research methods. Gives students the opportunity to extend previous term paper projects after exposure to social action and social systemic theoretical perspectives. *Prereq.* SOC 1147 or permission of instructor.

SOC 1355 Political Sociology: Who Gets What**4 QH**

Examines formal political structures and informal quasi-political groups. Focuses on sociological analysis of ideology, class politics, mass movements, and the conflict of various social and economic groups as they vie for political power and influence. *Prereq.* Permission of instructor or four sociology/anthropology courses.

SOC 1360 Social Stratification: Class, Status, and Power**4 QH**

Focuses on theories of social inequality, concepts of social class, aspects of status and role difference, criteria for social mobility. *Prereq.* Permission of instructor or four sociology/anthropology courses.

SOC 1365 Collective Behavior**4 QH**

Focuses on the rise of new group forms in response to persistent social unrest; masses, crowds, and publics; specific instances of collective behavior such as race riots, wildcat strikes, prison revolts, and campus disorders.

SOC 1375 Sociology of Occupations and Professions**4 QH**

Focuses on the meanings of work; division of labor and specialization; analysis of occupational structure and patterns of recruitment, training, and career preferences; the classic professions and new trends in professionalization. *Prereq.* Permission of instructor or four sociology/anthropology courses.

SOC 1376 Organization and Bureaucracy**4 QH**

Focuses on sociological study of organizations. Examines case studies of private corporations, federal bureaucracies, social service agencies, military-industrial complex, high-risk technological systems,

unions. Analyzes recent theories of innovation, participation, and opportunity in complex organizations.

SOC 1385 Social Deviance 2**4 QH**

Examines the leading theories of deviance (anomie, subcultural deviance, labeling) and their principal variants; studies their assumptions, conceptions, propositions, and supportive evidence; analyzes empirical studies in each theoretical tradition.

SOC 1405 Sociological Theories of Crime**4 QH**

Explores patterns and social forces involved in criminal behavior. Analyzes of sociological theories of criminality and comparison of these with other explanations of crime.

SOC 1470 Sociology of Religion**4 QH**

Offers a comparative and analytic treatment of religion as a social institution, focusing on the relations between religious organizations and other social institutions, with particular emphasis on the American experience. Analyzes religion as an agent of social change and stability. *Prereq.* SOC 1100.

SOC 1475 The Sociology of Mass Communication**4 QH**

(Formerly Mass Communication and Public Opinion)

Focuses on factors in the formation and development of public opinion, the effect of television on children, mass communication as social organization, media-depicted images of society, the role of personal influence, the process of rumor, the use of mass media by the poor, propaganda analysis, and the latent and manifest functions of mass communication.

SOC 1485 Computers and Society**4 QH**

Examines the impact of the computer revolution on the conditions of work and life in contemporary society including legal and theoretical issues. Discusses ethical and professional issues in computer use. (VI) *Prereq.* Junior in computer science or middler with ability to program.

SOC 1500 Applied Sociology: Practice and Theory**4 QH**

Analyzes the conditions under which sociological knowledge is applied to social problems, the kinds of problems, and the degree of effectiveness of this application. Pays particular attention to research and demonstration projects that derive from sociological theory.

SOC 1501 Social Policy and Social Intervention**4 QH**

(Formerly Social Control 2)

Focuses on study of the formation of social policies in response to social problems; analyzes policies and problems, supporters and opponents of policy change, conditions under which control agencies adopt new policies, and effects of policy change. Places particular emphasis on case studies of social action and legal change.

SOC 1525 Comparative Human Services 1**6 QH**

Offers an intensive look at the American human services system. Gives upper-level undergraduate and graduate students the opportunity to study the origins, development, and present state of human

services in the United States. Involves lectures as well as field visits in the Boston area. Provides independent study.

SOC 1526 Comparative Human Services 2 4 QH

Offers an intensive study of the British human services system. Provides students the opportunity to immerse themselves in the social and cultural context of British human services and involves field trips in London designed to examine firsthand the planning, administration, and delivery of human services in Great Britain.

SOC 1535 Seminar in Social Welfare 4 QH

Discusses problems in social welfare observed in the term between "Problems" and "Practicum." Requires a research paper, based on directed fieldwork in the intervening term.

SOC 1600 Senior Seminar 4 QH

Provides students the opportunity to analyze, from sociological perspectives, student experience in work and voluntary service and to develop and extend research interests related to that work or action experience. *Prereq.* Senior standing in sociology/anthropology or permission of instructor.

SOC 1601 Seminar in Current Emphases in Sociology 4 QH

Reviews and discusses selected sociological topics. *Prereq.* Junior or senior standing in sociology/anthropology or permission of instructor.

SOC 1602 Seminar in Current Emphases in Sociology: Writing and Talking in Sociology 4 QH

Considers prevailing modes of presentation in major journals and verbal presentation in teaching, consulting, for example. Requires class members to submit examples of their own writing for analysis. *Prereq.* Junior or senior standing in sociology/anthropology or permission of instructor.

SOC 1700 Introduction to Sociology (Honors) 4 QH

Honors equivalent of SOC 1100.

SOC 1710 Class, Power, and Social Change (Honors) 4 QH

Honors equivalent of SOC 1310. Any Honors Program member is eligible to enroll in this course.

SOC 1800, SOC 1801, SOC 1802, SOC 1803 4 QH each Directed Study

Offers independent work on a chosen topic under the direction of members of the department. Limited to qualified students with approval of department chair. *Prereq.* Junior or senior standing in sociology or permission of instructor.

SOC 1821, SOC 1822, SOC 1823, SOC 1824 4 QH each Junior/Senior Honors Program

For details contact the Honors Office, 183 Holmes.

INT 1150 Introduction to Women's Studies: Image, Myth, and Reality 4 QH

Surveys the issues and methodology involved in the interdisciplinary study of women. Encompasses the historical, political, economic, and social processes that have created both the image and the reality of

women in society. Through guest lecturers, provides an overview of the many different disciplinary approaches to the study of women. Required for women's studies minors and may be used either as a general elective or, depending on the discipline of the coordinator, to satisfy specific concentration requirements. (II)

INT 1151, INT 1152 Women's Studies: Seminars in Research 4 QH

These interdisciplinary women's studies seminars allow students to address problems in depth by researching a topic of particular interest. Working closely with the seminar professor or another appropriate faculty member, students choose a research problem and develop a research design and methodology. Opportunities are provided for sharing work in progress and for exchanging findings. The final product of the seminar is a major paper. These seminars are required for women's studies minors.

INT 1201 An Analysis of American Racism 4 QH

Discusses the cycle by which racism in our institutions helps form our attitudes and the manner in which those attitudes shape our institutions. Emphasizes is on the practical, day-to-day aspects of racism, rather than the theoretical and historical aspects.

INT 1215 Into the Ocean World 4 QH

Offers a comprehensive interdisciplinary introduction to the oceans. Focuses on the seas' complexity and the far-reaching consequences of our interactions with them. Uses a teaching team consisting of specialists in the sciences, social sciences, humanities, and arts, each with an interest in marine issues and a commitment to bridging the gaps among disciplines. Considers themes as broad as the oceans, but, when appropriate, focuses on Boston Harbor, a first step into the ocean world for those of us in this area.

INT 1400 Professional Practices: Individual and Social Dimensions 4 QH

Explores the dimensions and dilemmas of freedom and responsibility confronting professional people practicing within limits set by socioeconomic conditions, by clients, and by other professionals. Examines case histories to illustrate the dilemmas professionals face, the choices made, and the consequences these have on the freedom of the practitioner, and on personal and professional integrity.

INT 1401 Health Professions: Past, Present, Future 4 QH

Focuses on social history of the modern health professions. Explores long-range patterns in the organization and regulation of the health professions, beginning with the Middle Ages and emphasizing the Jacksonian period, industrialization, modern professional organizations, the growing role of the state, responses of the health professions, and the future of health care in the United States under various corporate/government schemes for reorganization and "accountability."

Speech Communication

Some courses in the College of Arts and Sciences are duplicated in different departments or colleges or within a department. You may not receive credit for two such courses. If you have a question about whether one course overlaps another, please consult the departments involved and the Office of the Dean before taking the course.

Numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 2.

SPC 1110 Voice and Articulation 4 QH
Focuses on voice technique. Emphasizes pitch, projection, articulation, and vocal variety. Combines theory and practical application.

SPC 1111 Oral Interpretation 4 QH
Focuses on application of basic vocal techniques to the dramatic reading of prose, poetry, and drama. Discusses that, through literary analysis, the author's meaning is understood and, by means of oral reading skills, communicated to an audience.

SPC 1115 Introduction to Communication Skills 4 QH
Focuses on the communication process and its function as a means of relating to the world, ourselves, and other people. Examines factors in intra- and interpersonal communication, group communication, and public speaking through lectures, discussions, structured learning experiences, and written assignments.

SPC 1116 Business and Professional Speaking 4 QH
Focuses on practice of oral presentations, group communication, conference and discussion techniques, interview methods, and occasion speaking. Combines performance aspects with case study methods of communication on the professional level.

SPC 1210 Advanced Voice and Articulation 4 QH
Develops and applies vocal techniques acquired in SPC 1110. Emphasizes on vocal analysis, flexibility, and regional patterns of speech. *Prereq.* SPC 1110 or permission of instructor.

SPC 1211 Advanced Oral Interpretation 4 QH
Provides the opportunity to develop further oral reading skills acquired in SPC 1111. Includes work with accents and dialects, study of reader's theatre, and an investigation of classical and modern philosophies of the art. *Prereq.* SPC 1111.

SPC 1232 Female-Male Communication 4 QH
Surveys the various dimensions of female-male relations as they are created, sustained, or disintegrated through communication transactions. Emphasizes the various images and stereotypes of male and female sexual identity as they affect and are affected by communication in the development of hostility, friendship, or intimacy. Examines temporary, permanent, and destructive female-male relations as they lead to alternate lifestyles.

SPC 1239 Argumentation and Debate 4 QH
Helps develop skills in rational decision making through advocacy. Gives attention to logical reasoning, psychological methods, and motivational techniques. *Prereq.* SPC 1115, SPC 1116, or permission of instructor.

SPC 1240 Competitive Strategies in Oral Communication 4 QH
Focuses on teaching and coaching techniques in intercollegiate speech competition. Concentrates on speech researching, writing, and criticism. Encourages students involved in speech competition or those studying fields that require competence in presentational skills. *Prereq.* SPC 1115 or permission of instructor.

SPC 1250 Introduction to Mass Communication 4 QH
Explores the many media through which people express themselves: radio, television, film, print, music. Pays attention to the role of the individual as a media consumer.

SPC 1300 Introduction to Communication Theory 4 QH
Offers basic knowledge and understanding of the processes involved in the transference of meanings. Discusses the problems involved in defining communication and the nature of communication. Examines various models of communication. Considers the nature of theory and requirements of adequate theory. Examines various theories of human communication, including psychological, sociological, information, and system theories.

SPC 1310 Rhetorical Theory I 4 QH
Examines various theories of rhetoric, starting with the early Greeks (Plato's "Phaedrus" and "Gorgias," Aristotle's "The Rhetoric"), progressing through the rhetoric of Rome (Cicero's "de Brute" and Quintilian's "de Institutione"), and moving into a brief synopsis of medieval rhetoricians (Peter Ramus, Thomas Wilson, Thomas de Quincey, Francis Bacon, George Campbell, Richard Whately). Focuses on the student's growing knowledge and appreciation of the history and principles of rhetoric, which are the foundation of oral discourse. *Prereq.* SPC 1115 and SPC 1250.

SPC 1315 Theories of Persuasion**4 QH**

Surveys theoretical and conceptual approaches and research pertaining to the effectiveness of communication that is intended to induce deliberately changes in attitudes, beliefs, values, and/or behavior.

SPC 1317 Theories of Audience Behavior**4 QH**

Surveys theoretical models, concepts, and research. Focuses on the role of the receiver as an active participant in the communication process. Considers individual information processing; listening as a learned behavior; intra-audience effects; relations between media and audience characteristics; dissemination, rumors, and information; and the development of societal norms and mores.

SPC 1318 Negotiation Skills**4 QH**

Investigates the skills involved in bringing matters to mutually acceptable settlements; applies those skills through lectures, discussions, and especially through performance in case studies and role-playing simulations. Includes such personal, professional, and governmental processes as conflict resolution, problem solving, and advocacy. Places particular emphasis will be placed on the collective bargaining process in the private and public sectors, including negotiation, mediation, and arbitration. *Prereq. Middle standing or higher or permission of instructor.*

SPC 1330 Interpersonal Communication 1**4 QH**

Focuses on the communication process. Examines the ways in which we relate to other individuals and factors that influence these processes.

SPC 1331 Interpersonal Communication 2**4 QH**

Focuses on application of concepts developed in SPC 1330. As an experiential course, explores ways of becoming more aware of one's self and one's relationships with others and examines various options for communicating and increasing knowledge of the group process. Enrollment limited. *Prereq. SPC 1330 or permission of instructor.*

SPC 1338 Group Discussion**4 QH**

Expects students to work in task groups to explore theory and research in the area of group dynamics and to apply their knowledge to the classroom experience as they work on developing skills in decision making, problem solving, membership, and leadership.

SPC 1410 Contemporary Public Address**4 QH**

Offers a critical study of the public address skills of leading contemporary speakers representative of important political and social movements. Helps students gain an appreciation of the dimensions and varieties of contemporary public address, broadly defined as symbolic discourse. Analyzes various theories and approaches to public address, examines rhetorical situations; critically evaluates the use of agitative and control strategies to accomplish social change.

SPC 1415 Persuasive Techniques**4 QH**

Offers a critical, in-depth analysis of instances of persuasion as they occur in social interaction, social movements, politics, and advertising; the practical

strategies employed; and the factors that influence the effectiveness of those strategies when persuaders attempt to influence others. *Prereq. SPC 1315 or permission of instructor.*

SPC 1430 Organizational Communication**4 QH**

Examines the nature of communication in the context of complex organizations. Explores both internal and external organizational communication. Analyzes communication networks, communication technologies, interpersonal communication modes, organizational interdependencies, and their effects on information transfer and diffusion. Includes a section on organizational communication assessment and communication program implementation. *Prereq. SPC 1250.*

SPC 1431 Mass Communication and the Organization**4 QH**

Explores advanced applications of mass communication to organizational communication problems. Reviews the principles of mass communication and organizational communication and evaluates different message diffusion strategies used in organizations. Includes problem analysis and student presentation. *Prereq. SPC 1250 and SPC 1430.*

SPC 1437 Consultation Skills**4 QH**

Gives students the opportunity to acquire the skills necessary to analyze communication difficulties in industry, organizations, and groups. Includes theory discussion, practice, and feedback, using case study method. *Prereq. SPC 1115, SPC 1300, SPC 1330, and SPC 1338.*

SPC 1450 Television 1**4 QH**

Introduces the student to the equipment of a broadcast studio, surveys broadcast production techniques, and provides opportunities in class for applied practice through the production of programming suitable for broadcast. *Prereq. SPC 1250 or permission of instructor.*

SPC 1451 Foundations of Broadcasting**4 QH**

Surveys the history, technology, and governmental regulation of broadcasting in the United States, as compared to other systems internationally. Describes the evolution of the medium, beginning with the 'wired' communication systems of Bell and Morse, the use of radio first for point-to-point communication and its growth into a mass medium, and finally, the post-World War 2 explosion of the television industry. Focuses on major personalities — inventors, corporation founders, and political leaders. Examines quarrels and resolutions in the context of the historical and contemporary state of the broadcasting industry. *Prereq. SPC 1250.*

SPC 1452 Radio 1**4 QH**

Focuses on the role of the producer/director in the creation, preproduction planning, and execution of local and network radio programs. Emphasizes live broadcasts and live assembly of partially pre-recorded programs. Spends a great deal of time on the written materials necessary for program planning. Also spends some time in the studio working on

model program production and, possibly, actual live music performance broadcasts. *Prereq.* *Permission of instructor.*

SPC 1453 Broadcast Management 4 QH
Examines four key areas that inform management practices: economics, FCC regulatory policies, external marketplace forces (competition), and internal organizational forces (people). Applies this understanding of contemporary management practices to case studies. *Prereq.* *SPC 1250 and middler status or above.*

SPC 1454 Programming for Radio and Television 4 QH
Focuses on the structure in which the programmer operates and the motivation for programming strategies. Examines practical components of the marketplace, such as ratings, public TV, contemporary radio, and deregulation. *Prereq.* *SPC 1250 and middler status or above.*

SPC 1455 Television 2 4 QH
Examines the history of the business of the television industry and endeavors to sharpen each student's ability to solve and criticize complex creative problems. Expects students to write convincing program treatments, analyze audience data, become well versed in current issues in the industry, and finish at least two television pieces. *Prereq.* *SPC 1250 and SPC 1450.*

SPC 1500 Special Topics in Speech Communication 4 QH
Offers an in-depth examination of a subject of particular significance to the field. *Prereq.* *Permission of instructor.*

SPC 1554 Special Topics in Broadcasting 4 QH
Introduces the student to the variety of roles played by broadcast professionals and to the interplay of professional functions integral to the broadcast industry. Focuses on a different aspect of the broadcast industry each term. *Prereq.* *SPC 1250 or permission of instructor.*

SPC 1555 Communication and the Quality of Life 4 QH
Offers students an opportunity to develop a meaning of the concept "quality of life" and to gain knowledge of subjective and objective methods for measuring and assessing that concept. Identifies, explores, and analyzes problems in professions that influence quality of life; evaluates possible solutions.

SPC 1600 Introduction to Communication Research 4 QH
Focuses on scientific method and epistemology as they apply to the investigation of communication phenomena. Assists students in finding and critically evaluating literature dealing with factors that influence the effectiveness of communication and that may be pertinent to either academic projects or managerial decision-making. *Prereq.* *SPC 1300 or permission of instructor.*

SPC 1610 Rhetorical Criticism 4 QH
Focuses on the principles of rhetorical analysis: theories, methods, and their application to discourses. Studies various types of discourse throughout the quarter. Pays attention to understanding various methods and problems in rhetorical analysis. Examines judgment criteria, as well as the role of rhetorical criticism in society. *Prereq.* *SPC 1310.*

SPC 1890, SPC 1891, SPC 1892 4 QH each
Directed Study

SPC 1895, SPC 1896 Internship in Speech Communication 4 QH
Provides students with the opportunity to gain academic credit for on-the-job training in an allied career field. Requires prior approval by a department committee, demonstration that the job allows opportunities to apply theoretical understanding to specific application in the work environment, and faculty advisement as well as on-the-job supervision.

Theatre and Dance

Numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 2.

DRA 1100 Introduction to Theatre Arts 4 QH
Provides a brief view of the historical development of acting, directing, and production design. Emphasizes appreciation of contemporary theatrical forms. (II)

DRA 1106 Theatre History—Beginnings to Renaissance 4 QH
Explores the history of the theatre and its development in the West, focusing on Greece, Rome, Medieval Europe, Golden Age Spain, and Elizabethan and Stuart England. (Can be taken independently of DRA 1107.)

DRA 1107 Theatre History—Renaissance to Naturalism 4 QH
Focuses on the development of theatre in the Italian Renaissance; the spread of Italianate forms throughout Europe during the seventeenth and eighteenth centuries; the rise of Romanticism in Germany and its spread; and the rise of realism and naturalism in France, Scandinavia, and throughout Europe. (Can be taken independently of DRA 1106.)

DRA 1112 Drama Theory/Criticism 4 QH
Examines the major historical statements of drama theory and contemporary drama criticism as evi-

denced in journalistic play reviews. Requires students to prepare reviews of local productions.

DRA 1114 Masters of the Theatre 4 QH
Overviews several great practitioners of theatre. In particular, stresses how society influenced the thought and craft of playwrights, actors, directors, designers, and theorists. Pays careful attention to how the play's ideas are translated into performance. Uses video and live performance, when possible, as integral elements in the course. (III)

DRA 1116 The American Theatre 4 QH
Focuses on the American theatre from the Revolutionary War to the present.

DRA 1117 The Theatre of Williams, Miller, and Albee 4 QH
Offers an intensive study of the works of three major post-World War II American playwrights.

DRA 1118 Black Theatre in America 4 QH
Surveys the history of black theatre artists in America from the time of Ira Aldridge to the present day. Also examines the works of black playwrights from the Harlem renaissance to the present, with an emphasis on the period beginning with Baraka's *Dutchman*.

DRA 1121 Contemporary Theatre 4 QH
Examines the current state of commercial, regional, and other noncommercial theatre in the United States, using readings, lectures, reports, and weekly visits to theatre productions in the area. Explores through lectures the background of these types of theatre in twentieth century American and European theatre.

DRA 1122 Twentieth-Century European Theatre 4 QH
Examines major twentieth-century European attempts to break away from the nineteenth-century realistic tradition. Explores representative works of expressionistic, symbolistic, epic, and absurd theatre artists.

DRA 1123 The Theatre of Ibsen, Strindberg, and Chekhov 4 QH
Offers an intensive study of the theatre of the three great masters of the naturalistic movement in Europe whose works stand as the foundation of modern drama.

DRA 1124 The Irish Theatre 4 QH
Focuses on theatre and drama in Ireland from their beginnings to the present, with the backgrounds of Irish folklore and history. Emphasizes developments in the twentieth century.

DRA 1125 The Theatre of the Absurd 4 QH
Focuses on the theatre of the absurd as an anti-literary reflection of and reaction to life and its effects on Western drama. Focuses on selected works and ideas of Jarry, Artaud, Camus, Sartre, Beckett, Genet, Ionesco, Pinter, Kopit, Brown, and Arrabal.

DRA 1127 The Comic Theatre 4 QH
Surveys theatrical comedy from the ancient Greeks to the present. Examines the comic playwright, the "joke writer," the comic director, the comedic actor,

and the standup comedian. Discusses theories and techniques of laughter, as well as the psychological and sociological benefits derived from laughter. Includes reading playscripts by Aristophanes, Molière, Shakespeare, Shaw, and Simon as well as viewing and listening to tapes of Chaplin, the Marx Brothers, and others. Examines comedy devices through lectures, films, records, and attending live performances.

DRA 1130 Eastern European Theatre and Drama 4 QH
Surveys the history of theatre and drama in Russia and Poland from the nineteenth century to the present. Emphasizes the contributions of Polish romanticism, developments in the Soviet theatre of the 1920s, and the work of major Polish and Russian dramatists and theatre artists who have influenced Western theatre profoundly.

DRA 1140 Playwriting I 4 QH
Emphasizes the principles and practices of modern dramatic composition: characterization, plot, plot structure, dialogue, and other dramaturgical elements as seen in the one-act play. Includes the writing of brief scenes, the dramatic composition, and the one-act play.

DRA 1149 Script Analysis for the Stage 4 QH
Aids the theatre practitioner in developing the skills necessary for analyzing scripts in preparation for production. Focuses on dramatic theory and structure and theatrical techniques that will enable an actor, director, designer, or playwright to uncover the problems of translating theory into practice.

DRA 1150 Introduction to Acting 4 QH
Focuses on fundamental techniques of stage use, the actor and the stage environment, and improvisations for strengthening imagination and increasing freedom. Analyzes scripts for work on performed scenes.

DRA 1155 Voice for the Theatre 4 QH
Focuses on vocal exercises that enable the actor to better connect with the voice through freeing the physical and emotional self. Emphasizes centering, physicalization, breath support, articulation, resonance, projection, and relaxation. Includes selected monologues and/or scenes for classroom analysis.

DRA 1160 Movement I 4 QH
Emphasizes using the body as an expressive instrument for Realism. Develops concentration, control, and stamina through exercise, relaxation, improvisation, manipulation of energy flow, rhythms, and imagination. *Prereq.* Theatre major or permission of instructor.

DRA 1180 Concepts of Direction 4 QH
Examines theories of dramatic presentation through analysis of selected historical developments. Focuses on purposes and techniques of theatrical direction related to script analysis, production style, pictorial composition, rhythmic evolution, and empathic responses. *Prereq.* DRA 1150 and DRA 1212.

DRA 1200 Stagecraft**4 QH**

Focuses on principles that underlie the coordination and execution of technical production. Examines different kinds of scenery, tools, equipment, construction materials, and lighting techniques. Lab work involves preparing technical elements of University productions.

DRA 1209 Theatrical Drafting**4 QH**

Through work on supervised classroom projects, exposes the student to the basic graphics language needed to translate a designer's ideas into technical drawings used for construction. *Prereq.* DRA 1200.

DRA 1210 Scenic Design for the Stage**4 QH**

Introduces the theory and practice of theatrical design and the role of the designer in the production process. Through project work, examines the use of the graphics tools—line, form, balance, color, rhythm, etcetera—in the development of the design idea. Emphasizes understanding and utilizing spatial relationships, visually expressing conceptual themes, and understanding the various uses, problems, and practical considerations of proscenium, thrust, and arena staging. Analyzes historical production styles from the Greco-Roman period through the nineteenth century. *Prereq.* DRA 1200, DRA 1212, or permission of instructor.

DRA 1212 Introduction to Theatrical Design**4 QH**

Introduces the visual effects of modern theatrical production and the creative processes by which these come into being, through a basic survey of the three major design disciplines, their supporting technology, and their working interrelationship. Addresses the questions of how artistic concepts are developed and related, how they are communicated to other artists and an audience, and how one develops the critical processes necessary to evaluate these concepts.

DRA 1213 Scene Design 2: Principles**4 QH**

Focuses on the development and expression of conceptual statements from specific dramatic texts through a series of exercises involving script analysis and introductory work in rendering and model construction. Examines texts selected from works of distinct historical and stylistic periods. Studies the heritage of twentieth-century theatrical design through the work of artists such as Appia, Craig, Jones, Urban, and Oenslager. Emphasizes the development of such stylistic treatments as realism, expressionism, symbolism, and constructivist and environmental design. *Prereq.* DRA 1210.

DRA 1214 Scene Design 3: Techniques**4 QH**

Focuses on the practical application of the theories, materials, and techniques of contemporary design. Emphasizes furthering the student's ability to research a project as well as executing perspective drawings, renderings, and painter's elevations. Bases assignments in critical analysis on various contemporary American and European production of dramatic and operatic works. Discusses the work of such influential designers as Aronson, Bay, Mielziner, and Svoboda as well as the contributions of such

nontheatre artists as Chagall, Dali, and Picasso. *Prereq.* DRA 1213.

DRA 1225 Scene Painting**4 QH**

Traces the history of scene painting and ornament from classical to contemporary times. Focuses on studio organization, color, color theory, equipment, tools, materials, and costs involved with painting stage scenery. Uses projects and exercises in the use of different media, matching colors, painting of textures, light and shade, and the use of stencils and physical textures. Includes lab sessions involving painting stage scenery for University productions. *Prereq.* DRA 1200 or permission of instructor.

DRA 1226 Lighting Design for the Stage**4 QH**

Examines basic principles and practices of stage lighting, including the qualities and functions of light, lighting instruments and controls, basic electricity, color in light, and analysis of the script in terms of light requirements. Expects students to develop light plots and schedules for various kinds of stage productions. Includes lab work on lighting crews for University productions. *Prereq.* DRA 1200, DRA 1212, or permission.

DRA 1246 Sound for the Theatre**4 QH**

Beginning with a basic introduction to both natural and electronically produced sound, goes on to discuss the component parts of sound systems, their theories, and their applications. Discusses and demonstrates techniques of recording and editing, with particular reference to the creation of sound tracks and effects for theatrical productions. Explores the concepts of sound-reinforcement systems for musicals, concerts, and other current professional applications.

DRA 1261 Costuming 1**4 QH**

Presents the beginning designer with the opportunity to investigate costume design theory and to foster perceptual development. Through lectures and projects, gives students the opportunity to explore both the abstract and historical aspects of costume design as well as textual analysis and its conceptual implications. (Does not require prior art or design education.)

DRA 1265 Pattern Drafting and Costume Construction**4 QH**

Develops the skills and techniques necessary for the patterning, cutting, and construction of costumes for the stage. Covers flat pattern drafting, draping, and finishing techniques.

DRA 1280 Stage Makeup**4 QH**

Focuses on the principles of, the reasons for, and the materials used in makeup for the theatre, television, and films. Includes the practical application of types and styles of makeup—straight, old-age, character, and corrective.

DRA 1284 Theatre Management**4 QH**

Focuses on theatre management, including problems of financing, promoting, and programming for educational, community, profit, and nonprofit professional theatre.

- DRA 1292 Children's Theatre** 4 QH
Focuses on theories and methods of creative techniques related to children's programs in schools, churches, and recreational facilities. Analyzes literature in preparation for production of children's plays.
- DRA 1300 Acting 2** 4 QH
Focuses on developing the actor's sense of truth and emotional freedom. Emphasizes creating, developing, and sustaining character and developing ensemble. Includes monologues and scenes performed for classroom analysis. *Prereq.* DRA 1150 or permission of instructor.
- DRA 1301 Acting 3** 4 QH
Focuses on further development of the actor's tools, script and character scoring, and exercises for physical and psychological freedom. Includes in-class scenes from works in progress. *Prereq.* DRA 1300.
- DRA 1302 Acting 4** 4 QH
Deals with scene work from a spectrum of theatrical genre. Focuses on developing a technique for approaching a role through research, character, and language. *Prereq.* DRA 1301 or permission of instructor.
- DRA 1316 Acting for the Camera (Television)** 4 QH
Presents the fundamentals of camera acting, adjusting the actor's physical responses to the mechanical eye of the camera and the delicate ear of the microphone. Involves studio work before the television camera to explore the genres of dramatic, commercial, and industrial acting. *Prereq.* DRA 1150, DRA 1155, DRA 1160, DRA 1300, DRA 1301, and DRA 1302.
- DRA 1325 Musical Theatre Technique** 4 QH
Applies acting technique to the performance of musical material. Explores song through text and character progression, develops a process for approaching a song, and synthesizes movement, gesture, and emotion with melody, rhythm, and lyrics. Involves student performances of solo, small ensemble, and large ensemble material. Does not involve singing technique. *Prereq.* DRA 1150, DRA 1300, or permission of instructor.
- DRA 1350 Problems in Direction** 4 QH
Presents experimentation in theory related to the staging of classical and modern drama. Analyzes plays in actual production: casting, rehearsals, character interpretations. Requires that each student be responsible for the production of a one-act play. *Prereq.* DRA 1180.
- DRA 1370 Rehearsal and Performance** 4 QH
Allows students to participate in public performance through preparation and rehearsals in areas of acting, directing, design, and stagemanaging. *Prereq.* Permission of instructor.
- DRA 1400 Costuming 2** 4 QH
Offers advanced study in textual interpretation and its application to costume design. Emphasizes conceptual and stylistic development through assigned projects in the various genres of the performing arts. *Prereq.* DRA 1261 or permission of instructor.
- DRA 1410 Technical Production** 4 QH
Allows the opportunity to acquire and explore the requisite skills for developing working drawings and budgetary analyses for theatrical productions. Focuses on several projects and includes the opportunity to coordinate one substantial production. Requires that the specialized study be executed in close supervision with the instructor. *Prereq.* Completion of all courses stipulated in production/design concentration and permission of instructor.
- DRA 1420 Advanced Drafting and Construction** 4 QH
Offers specialized study in technical production techniques. Covers drafting procedures necessary for the conversion of designer's drawings into detailed rear elevation and construction layouts, as well as the development of section, isometric, and oblique views. Through a series of practical and project exercises, analyzes the various factors governing the construction and rigging of two- and three-dimensional scenery, linear-motion, rotary-motion, and elevating systems. Emphasizes theatrical problem solving with regard to safety, dependability, and economy. Lab fee. *Prereq.* DRA 1209.
- DRA 1430 Lighting Design 2** 4 QH
Offers an intensive study of lighting design theory and practice. Expects students to design numerous lighting plots, sections, instrument schedules, and design concepts for various types of productions and spaces. Investigates and discusses current professional techniques and practices. *Prereq.* DRA 1226.
- DRA 1500 Playwriting 2** 4 QH
Continues DRA 1140. *Prereq.* DRA 1140.
- DRA 1505 Continental Drama** 4 QH
Covers seminal late nineteenth- and mid-twentieth-century continental drama. Focuses on playwrights whose plays had a major impact on modern drama and theatre.
- DRA 1510 Twentieth Century Theatre** 4 QH
Studies the history of the post-naturalistic theatre in Europe and the United States. Explores the work and influence of such figures as Craig, Appia, Meyerhold, Brecht, Artaud, Grotowski, Beck and Molina, Schechner, and Chaiken.
- DRA 1800, DRA 1801, DRA 1802, DRA 1803** 1 QH each
Practicum in Production
Offers lab practice in technical production; can be repeated for credit (maximum four credits). *Prereq.* Departmental permission.
- DRA 1810, DRA 1811, DRA 1812, DRA 1813** 4 QH each
Junior/Senior Honors Program
- DRA 1820, DRA 1821, DRA 1822,** 4 QH each
DRA 1823 Directed Study
- DRA 1840, DRA 1841, DRA 1842,** 4 QH each
DRA 1843, DRA 1844, DRA 1845, DRA 1846,
DRA 1847, DRA 1848, DRA 1849
- Special Topics in Theatre/Dance Performance**
Offers opportunity for in-depth examination of a subject of particular significance to the field.

DRA 1860, DRA 1861, DRA 1862, DRA 1863, 4 QH each
DRA 1864, DRA 1865, DRA 1866,**DRA 1867 Special Topics in Theatrical Design**

Offers opportunity for in-depth examination of a subject of particular significance to the field.

DRA 1890, DRA 1891, DRA 1892, DRA 1893 4 QH each
Special Topics in**Theatre History/Dramatic Criticism**

Offers opportunity for in-depth examination of a subject of particular significance to the field.

INT 1100 Introduction to Art, Drama, and Music 4 QH

Offers an interdisciplinary, integrated approach to three related disciplines: art, drama, and music. Establishes basic vocabulary and analytical techniques for each discipline, emphasizing such common elements as color, line, rhythm, texture, and form. Examines representative works from various

periods in the context of the cultures that produced them; focuses on parallels and contrasts among the three disciplines' manifestations of specific trends, principles, and ideals. Supplements lectures, readings, and listening assignments with visits to art galleries and attendance at concerts and theatrical performances. (II)

INT 1110 American Musical Theatre 4 QH

Traces the development of the American musical from works such as *The Black Crook* to the present. Considers the role of musical theatre, both as entertainment and as serious art form, through an examination of script, score, dance, and design. Studies works by composers and lyricists such as Bernstein, Rodgers and Hammerstein, the Gershwins, Weill, Lerner and Loewe, and Cole Porter.

Accounting

ACC 1111 Accounting Principles 1 4 QH

This first of a series of accounting courses assumes students do not possess knowledge of the subject. Both this course and ACC 1112 are designed to help provide an understanding of accounting issues and objectives for proper interpretation and analysis of financial data. Specific topics covered in this first course are the nature, function, and environment of accounting; the basic accounting model; financial and analytical ratios; the accounting cycle; accounting for merchandising entities; and the control of cash and receivables. *Prereq. Sophomore standing.*

ACC 1112 Accounting Principles 2 4 QH

In this second of a series of courses, students are introduced to financial and managerial accounting decisions through class discussions, short exercises, and demonstration problems. Specific topics covered include control of inventory; acquisition, depreciation, and disposal of plant and equipment; paid-in capital related to sole proprietorships, partnerships, and corporations; short- and long-term debt financing; the analysis and interpretation of financial reporting; and the statement of changes in financial position. *Prereq. ACC 1111 and sophomore standing.*

ACC 1210 Introduction to Accounting for the Non-Business Major 4 QH

Specifically for non-business majors, this course is designed to help provide a fundamental knowledge of accounting to students who do not expect to become accountants but who would like the opportunity to learn to understand, interpret, and make use of accounting data. The course includes a survey of the foundations of accounting and the role it plays in the management of the profit and nonprofit sectors of the American economy. *Not open to College of Business Administration students.*

ACC 1330 Cost Accounting for Management 4 QH

Examines cost accounting from a managerial viewpoint. Stresses the impact of quantitative and behavioral aspects on budgets and cost control is stressed. Designed specifically for management majors. *Prereq. ACC 1112 and middler standing.*

ACC 1331 Intermediate Accounting I 4 QH

The principal foundation course for accountants begins with a comprehensive review of basic accounting principles, operations, and financial statements. Development of accounting theory is stressed in the analysis of alternative treatments and procedures. Specific areas receiving intensive treatment are cash, accounts receivable, inventories, and current liabilities. *Prereq. ACC 1112 or equiv. and middler standing.*

ACC 1332 Intermediate Accounting 2 4 QH

This course is a continuation of the study of accounting principles, concepts, and procedures introduced in ACC 1331. Specific topics emphasized are long-term assets, depreciation, stockholders equity, and EPS. *Prereq. ACC 1331 and middler standing.*

ACC 1339 Cost Accounting I 4 QH

Examines cost determination and use. Special consideration given to manufacturing concerns. Specifically covers cost behavior, relevant costs, performance evaluation, budgets, and standard costs. *Prereq. ACC 1112 and middler standing.*

ACC 1340 Cost Accounting 2 4 QH

Continuation of ACC 1339. Focuses on the use of cost data in decision making, budget planning, and the control process. *Prereq. ACC 1339.*

ACC 1343 Intermediate Accounting 3 4 QH

Completion of the study of basic accounting concepts and special areas of concern to modern accounting practice. Studies leases, pensions,

accounting changes, income tax accounting, changes in financial position, price-level and current-value accounting. *Prereq.* ACC 1332.

ACC 1345 Accounting Systems

4 QH

Examines the process of designing financial and managerial accounting systems. Uses a conceptual approach and considers the appropriate use of computer technology in designing new systems. Assumes an understanding of accounting processes in both financial and managerial areas. *Prereq.* *Middler standing.*

ACC 1347 Auditing

4 QH

Examines audit concepts, standards, and procedures, including the auditor's legal and ethical responsibilities, for students who plan to enter the public accounting profession. Emphasizes concepts rather than procedures. Specifically covers auditing standards, auditor's reports, internal control, statistical sampling, electronic data processing (EDP), and legal liability. *Prereq.* ACC 1343.

ACC 1351 Federal Income Taxes 1

4 QH

Emphasizes basic understanding of the federal income tax structure relating to individuals rather than corporations. Requires completion of several research cases directed at solving various tax problems. Through case studies, introduces the current Internal Revenue Code, income tax regulations, and cumulative bulletins. Discusses tax-court cases and various private company publications. *Prereq.* ACC 1343.

ACC 1505 Internal Auditing

4 QH

Helps students understand how the internal auditor undertakes a review and appraisal of operations. Focuses on the internal audit environment, preparation of long-range programs, performance of preliminary surveys, flowcharting, development of audit programs, sampling, audit techniques, and reporting. Case-study oriented. *Prereq.* *Middler standing.*

ACC 1512 Federal Income Taxes 2

4 QH

This course is a continuation of ACC 1511. Topics include taxpayers other than individuals and the treatment of property transfers that are subject to federal, gift, estate, and trust taxes. Tax research is an important element of this course. A major emphasis is given to tax planning considerations, especially to gift and death tax consequences. *Prereq.* ACC 1511.

ACC 1521 Advanced Accounting Problems

4 QH

This course is an in-depth analysis of various accounting topics for the student planning a career as a professional accountant. Topics covered are government and not-for-profit accounting; partnerships; installment sales; consignments; segment and interim reporting; foreign currency accounting; troubled-debt restructurings; and liquidations, estates, and trusts. *Prereq.* ACC 1343.

ACC 1522 Advanced Accounting for Business Combinations

4 QH

This course is a comprehensive analysis of the accounting theory and practice associated with

corporate acquisitions and combinations. Topics include methods of consolidation-elimination of profits on intercompany transactions, purchase versus pooling of interests, and accounting for good will. The course is intended for the serious student preparing for a career as a professional accountant. *Prereq.* ACC 1343 or permission of instructor.

ACC 1526 Management Accounting

4 QH

Examines the role of the management accountant. Studies relation between financial and managerial accounting, design and use of accounting and control systems, measurement techniques and uses, the role of behavior in accounting, performance evaluation, and other topics of current interest. *Prereq.* ACC 1349.

ACC 1531 Contemporary Accounting Problems

4 QH

Survey some of the important problem areas currently facing the accounting profession. Discusses asset valuation, price-level adjusted statements, environmental considerations, income measurement, and governmental intervention. *Prereq.* ACC 1332 and *middler standing.*

ACC 1535 Computers in Accounting and Auditing

4 QH

Examines the use of computers in accounting and auditing. Covers systems design and applications in accounting, internal control of computer-based systems, computer audit and control guidelines, and EDP audit tools and techniques. *Prereq.* ACC 1501 or ACC 1505.

ACC 1548 Accounting Theory and Practice

4 QH

Examines the theory, practice, and several controversial areas in corporate financial reporting; the pronouncements and research studies of the authoritative institutions of the profession relating to the practice of accounting; and the textual and periodical literature on accounting theory. *Prereq.* ACC 1343.

ACC 1549 Accounting Planning and Control

4 QH

Examines the role of management planning and control systems and the problems inherent in design and use. Defines the process of identifying factors in the design of those systems. *Prereq.* ACC 1339.

ACC 1591 Independent Study

1 QH

This course is for the student who has received approval to undertake independent study in lieu of any course required in the various concentrations. Students present proposals to an Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study will take place. A copy of the final report prepared by the student will be presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from area coordinators.

ACC 1592 Independent Study

2 QH

Same as ACC 1591.

ACC 1593 Independent Study	3 QH	ACC 1712 Honors: Accounting Principles 2	4 QH
Same as ACC 1591.		See course description for ACC 1112.	
ACC 1594, ACC 1595, ACC 1596, ACC 1597 Independent Study	4 QH	ACC 1891 Honors Thesis in Progress	0 QH
Same as ACC 1591.		ACC 1892 Honors Thesis	8 QH
ACC 1711 Honors: Accounting Principles 1	4 QH	ACC 1893 Honors Thesis in Progress	0 QH
See course description for ACC 1111.		ACC 1894 Honors Thesis	12 QH

Entrepreneurship

ENT 1330 Management of Smaller Enterprises 4 QH

Focuses on the strategies and operating problems of smaller, already established business enterprises. Designed for individuals who are considering entrepreneurial careers or careers in management, finance, or marketing within the smaller-company environment. Explores the characteristics and urgencies of problems that smaller companies are likely to encounter at different stages in their evolving life cycle, from the postnatal period to the more mature stage. *Prereq.* *Middler standing.*

ENT 1344 Opportunity Analysis and Venture Capital 4 QH

Focuses on the essential tasks performed prior to establishing a new venture, including finding a suitable business opportunity or developing an idea for a product or service; analyzing the feasibility of the opportunity or idea; developing a business plan; structuring the venture team; seeking sources of seed capital; and forming a venture action plan for beginning operations.

ENT 1352 New Venture Creation: A Career Choice 4 QH

Assists students interested in small business in answering a number of important questions through a systematic analysis of their own potentials for entrepreneurial careers: What is involved in starting my own business? What is my own entrepreneurial orientation and commitment? What managerial and behavioral skills do I need for achievement? How can I plan for my personal and entrepreneurial goals? Presents case discussions, self-assessment, goal-setting exercises, guest speakers, and a student-selected project are used. *Prereq.* *Senior standing.*

ENT 1358 Small Business Institute Project 8 QH

The Small Business Institute Project was brought into existence with the cooperation of the Small Business Administration (SBA) and some of its client companies in Greater Boston. A student team is expected to interact with a company, helping management to analyze opportunities and problems facing the business, and to develop practical recommendations for the company's decision makers. Students are expected to allocate approximately one day per week to the project, including on-site work

with the company owner-managers with whom they have been paired and to participate in related research, report preparation, and presentation of results. This real-world experience is blended with occasional class meetings and frequent team meetings with a faculty member to discuss the field work and to explore alternatives. Interim progress reports and a final report are presented to the client company, SBA, and the class. *Prereq.* *Junior standing; one entrepreneurship course or permission of instructor.*

ENT 1591 Independent Study 1 QH

This course is for the student who has received approval to undertake independent study in lieu of any course required in the various concentrations. Students present proposals to an Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study will take place. A copy of the final report prepared by the student will be presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from area coordinators.

ENT 1592 Independent Study 2 QH

Same as ENT 1591.

ENT 1593 Independent Study 3 QH

Same as ENT 1591.

ENT 1594, ENT 1595, ENT 1596, ENT 1597 Independent Study 4 QH

Same as ENT 1591.

ENT 1598 Independent Study 8 QH

Same as ENT 1591.

ENT 1891 Honors Thesis in Progress 0 QH

ENT 1892 Honors Thesis 8 QH

ENT 1893 Honors Thesis in Progress 0 QH

ENT 1894 Honors Thesis 12 QH

Finance and Insurance

FIN 1201 Personal Finance

4 QH

Focuses on management of the total personal estate: budgeting, savings, insurance, investments, borrowing, taxes, Social Security, pensions, annuities, securities markets, mutual funds, and their integration. *Not open to College of Business Administration students.*

FIN 1333 Financial Institutions and Markets

4 QH

Explores the financial environment faced by a firm as well as the financial institutions serving the economy. Discusses the forces that determine the changes in money and capital markets and explores the implications of changing financial environment for the management of funds in a firm and/or financial institution. *Prereq. ACC 1112 and middler standing.*

FIN 1335 Managerial Finance

4 QH

The objective of the course is to provide students the opportunity to gain knowledge of the advanced tools and concepts used in the management of funds. Topics include inventory and credit policies, risk, capital budgeting, financial structure, cost of capital, dividend policy, and valuation of a firm. Overall financial strategy and timing of its implementation are also examined. Specialized topics — mergers and acquisitions, financial failure, and financial policy for multinational firms — may be considered in the course. *Prereq. FIN 1438 and middler standing.*

FIN 1346 Investment Management

4 QH

Presents a broad overview of the concepts, practices, and procedures of investment management. Covers basic security types, security market operations, security analysis (both fundamental and technical), and an introduction to portfolio management. *Prereq. FIN 1438 and FIN 1333.*

FIN 1438 Introduction to Finance

4 QH

The objective of this course is to acquaint students with basic processes, principles, tools, and concepts of finance. Topics include financial analysis, financial forecasting, profit planning, budgeting, working capital management, and capital budgeting. The basics of financial markets, institutions, and sources of supply of different types of funds available to a firm are also covered. *Prereq. ACC 1112, MSC 1201, and middler standing.*

FIN 1503 Taxes and Financial Decisions

4 QH

In this course, the case method is used to discuss a number of financial decisions that are greatly influenced by tax considerations, the most important of which are concerned with capital structure, dividend policy, acquisition terms, investment policies and liquidations. The federal income tax receives primary consideration, but state and foreign taxes are also discussed. *Prereq. FIN 1438 and middler standing.*

FIN 1520 Speculative Markets

4 QH

The purpose of this overview course is to familiarize the student with all aspects of speculative markets, including options, futures, and options on futures. *Prereq. FIN 1346.*

FIN 1522 Option Markets

4 QH

While puts and calls have been traded for many years, a market for listed options appeared only in 1973. Trading options on exchanges made such activity much easier and opened many more opportunities for both speculation and the protection of security positions. The purpose of this seminar is to explain the basic mechanics of this market, the characteristics of puts and calls, the techniques that may be applied, and current developments in the field. Students will be required to do individual research related to current methodology and concepts. Some knowledge of money and capital markets, as well as corporate finance, is necessary for those taking the course. *Prereq. FIN 1520.*

FIN 1525 Financial Futures

4 QH

This is a seminar in financial futures markets centered in the area of interest-rate and stock-index futures. The course covers the methods of trading, margins, hedging, spreading futures contracts in treasury bills, commercial paper, treasury bonds, treasury notes, GNMA's, and other topics. Students prepare a seminar report on some aspect of the futures market. *Prereq. FIN 1520.*

FIN 1526 Securities Markets

4 QH

Analyzes the operation of the securities market. Provides students the opportunity to examine in detail the operation and function of investment bankers, broker-dealers, and securities exchanges. Thorough studies the mechanics of cash and margin accounts, trading options, and regulations affecting securities markets. *Prereq. FIN 1438 and middler standing.*

FIN 1530 Working Capital Management

4 QH

Examines strategies and analytical approaches to managing current assets and current liabilities. Explores corporate cash management under changing money market conditions. Discusses the use of interest rate futures and working capital management in a multinational context. *Prereq. FIN 1438.*

FIN 1531 Capital Investment Decision Analysis

4 QH

Analyzes capital budgeting techniques and portfolio considerations, including risk analysis, capital structure and valuation, and other long-term corporate finance topics. *Prereq. FIN 1438.*

FIN 1538 Financial Ethics

4 QH

Investigates and helps develop a systematic understanding of ethical dilemmas of financial business decision making. Examines the influence of business

cultures on personal behavior, combining wisdom of the past with current ethical thinking and each individual's standards. *Prereq.* FIN 1438.

FIN 1540 Management of Financial Institutions 4 QH

Studies the decision-making problems faced by financial institutions such as commercial banks, savings and investment institutions, and finance companies when viewed as competitive, profit-seeking business entities. Covers such topics as the nature and scope of the capital markets confronting institutions, specialized problems regarding the sources and uses of funds of financial institutions, the nature of competition, the regulation of financial institutions, and strategic policy planning of financial institutions. *Prereq.* FIN 1438 and FIN 1333.

FIN 1543 Modern Portfolio Management 4 QH

Analyzes the methods of selection, revision, and performance measurement of asset portfolios. Exposes the students to the current methods of building an asset portfolio. Presents and evaluates the concept of the efficient frontier of assets in the risk-return space. Includes a simulated equity fund-management project, in which students select equity securities and then prepare and present annual reports evaluating their portfolios' construction and performance. *Prereq.* FIN 1346.

FIN 1544 Bank Management 4 QH

Examines the financial management of commercial banks and thrift institutions. Analyzes the problems of liquidity and investment management, loan portfolio and capital management, and pricing problems associated with various sources and uses of funds in the context of changing economic and regulatory environment for these institutions. Presents lectures, discussions, and cases. *Prereq.* FIN 1438 and FIN 1333.

FIN 1545 Investment Banking 4 QH

Focuses on the managerial functions of investment banking firms. Examines individual investors and institutions in the money and capital markets from the viewpoint of investment banking firms. Familiarizes students with the operating and cash flow characteristics of institutional and individual clients. *Prereq.* FIN 1438.

FIN 1549 Principles of Real Estate 4 QH

Surveys the field of real estate, including principles of real estate law, valuation, brokerage, finance, land use, and negotiations. Gives the student the opportunity to become a better decision maker and to prepare for future studies in real estate. *Prereq.* FIN 1438.

FIN 1550 Real Estate Finance: Analysis and Investment 4 QH

Presents real estate financing techniques, sources of funds, and investment property analyses. Examines the legal and financial aspects of such techniques as mortgage liens, leaseholds, contracts for deed, and sale-leasebacks, as well as the primary and secondary mortgage markets. Surveys methods of valuing income properties. *Prereq.* FIN 1549.

FIN 1562 Employee Benefits Management 4 QH

Covers the design, implementation, and financing of corporate employee benefit plans. Presents a comprehensive analysis of qualified and non-qualified benefit and executive compensation plans. Emphasizes the proper management, design, and financing of these plans to achieve corporate goals at minimum feasible cost. Studies alternative methods of financing benefit and executive compensation plans. Includes recent developments in Social Security, benefits, and tax legislation. *Prereq.* FIN 1438 and *middler standing*.

FIN 1566 Risk Management and Insurance 4 QH

Emphasizes the functional area of corporate risk management. Covers such areas as organizing and controlling the risk management function; identifying, measuring, controlling, and financing risk; selecting the best method of risk treatment; and implementing and monitoring risk management. Topics of exposure analysis include property, liability (public, employer, products, officers and directors, and professionals), income, and extraordinary expense losses. Covers treatment methods such as self-insurance, off-shore captive, retention groups, and commercial insurance. Includes recent developments such as tort reform integration of risk management with modern financial theory, as well as implications and analysis of recent tax reforms. *Prereq.* FIN 1438 and *middler standing*.

FIN 1580 Personal Financial Management 4 QH

In this course, emphasis is placed on the development of personal financial management expertise, based on an integrated plan for personal choices in which alternative courses of action are judged by their contribution to the attainment of the decision maker's particular set of economic objectives. The overall personal economic plan is the consistent focus of the course and unites such diverse topics as inflation and investment selection, insurance, short- and long-run hedges against the purchasing power risk, and purchasing assets. The course is decision oriented, and students are exposed to alternative courses of action and lead toward a rational solution through development of techniques of estimating the success probabilities of alternative methods. *Prereq.* FIN 1438 and *middler standing*.

FIN 1582 Personal Insurance Planning 4 QH

Insurance planning is an important part of financial planning. In this course, focus is on the informed decisions necessary to establish a comprehensive, rational plan of personal insurance. Class discussion, lectures, and readings examine the various kinds of personal insurance and how to create an insurance package for clients with different insurance needs. *Prereq.* FIN 1438.

FIN 1591 Independent Study 1 QH

This course is for the student who has received approval to undertake independent study in lieu of any course required in the various concentrations. Students present proposals to an Independent Studies Committee for evaluation and approval. Every

proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study will take place. A copy of the final report prepared by the student will be presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from area coordinators.

FIN 1592 Independent Study 2 QH
Same as FIN 1591.

FIN 1593 Independent Study 3 QH
Same as FIN 1591.

FIN 1594, FIN 1595, FIN 1596, FIN 1597 Independent Study 4 QH
Same as FIN 1591.

FIN 1738 Introduction to Finance (Honors) 4 QH
Acquaints students with basic processes, principles, tools, and concepts of finance. Topics include financial analysis, financial forecasting, profit planning, budgeting, working capital management, and capital budgeting. Covers the basics of financial markets, institutions, and sources of supply of different types of funds available to a firm. *Prereq.* ACC 1112, MSC 1201, and middler standing.

FIN 1759 International Financial Markets 4 QH
Introduces international financial markets, including balance of payments, history of the international monetary system, exchange-rate determination, foreign-exchange-exposure hedging strategies, and international capital markets. Emphasizes how international financial markets work and how corporations must adapt their decision-making to the international environment. *Prereq.* FIN 1438.

FIN 1760 International Financial Management 4 QH
Examines how the financial strategies and policies of multinational corporations differ from domestic corporations and how financial management is utilized in an international setting to achieve corporate goals. Specific topics include cost of capital, capital budgeting, capitalization policies, and management techniques for dealing with exchange-rate exposure and working-capital issues. Knowledge of exchange rates is assumed. *Prereq.* FIN 1759.

FIN 1770 Small-Business Finance 4 QH
In this course, the basic processes, principles, tools, and concepts of finance are utilized within the parameters of a small business to develop a complete financial plan that projects the future circular flow of funds by analyzing and then integrating the impact of both investment decisions (use of funds) and financial decisions (source of funds). *Prereq.* FIN 1438.

FIN 1804 Issues in Corporate Control (Honors) 4 QH
Examines the nature of conflicts between managers and shareholders over control of a corporation. Explores the effects of corporate control on financial performance of a firm and on decisions within the firm. Covers topics such as "managerialism," agency theory, problems in defining control of a corporation,

and stock-price theory. Analyzes issues of dissident shareholder actions, such as proxy fights and hostile takeover attempts. *Prereq.* Honors participation or permission of instructor.

FIN 1806 Investment Arbitrage (Honors) 4 QH
The purpose of this course is to provide the student with an opportunity to develop the prerequisite skills necessary for conducting successful investment arbitrage. Incorporating the recent insights into arbitrage pricing theory, students conduct an extensive computerized analysis of the arbitrage opportunities in the financial equity, debt, option, and futures markets. Examination of this emerging and popular investment approach is augmented with the appearances of guest arbitrage practitioners. *Prereq.* Honors participation or permission of instructor.

FIN 1808 The Chief Financial Officer (Honors) 4 QH
Develops, primarily through student interaction with financial executives, an understanding of the changing role of the CFO and to address significant topics in financial management. Topics include financial ethics, hostile takeovers, financial public relations, legal aspects of financial management, financial strategies at high-technology and public utility companies. Students develop research papers based on readings, case studies, and discussions with CFOs who participate in class sessions. *Prereq.* Honors participation or permission of instructor; junior standing.

FIN 1809 Restructuring the Modern Corporation (Honors) 4 QH
Investigates motivations, objectives, and results of different types of corporate restructurings. Covers stock buybacks, leverage buyouts (LBOs), spinoffs, mergers, and capital structure changes (recapitalizations). Focuses on development of a historical perspective in regard to restructuring; a theoretical background, concentrating on stock price theory, dividends, mergers, and hostile takeovers; and a working knowledge of techniques and financial statement consequences of restructuring. Utilizes case discussions. Knowledge of spreadsheet software mandatory. *Prereq.* Honors participation or permission of instructor.

FIN 1810 Contemporary Issues in Corporate Finance (Honors) 4 QH
Examines recent developments in financial markets and the corporate environment. Issues include security offerings, signaling, and the implications for financial structure; option pricing and financial policy; and the disciplining effects of the market for corporate control and the wealth consequences to participating parties. *Prereq.* Honors participation or permission of instructor.

FIN 1891 Honors Thesis in Progress 0 QH

FIN 1892 Honors Thesis 8 QH

FIN 1893 Honors Thesis in Progress 0 QH

FIN 1894 Honors Thesis 12 QH

Human Resources Management

HRM 1332 Introduction to Human Resources Management

4 QH

Helps students develop understanding of contemporary issues in human resource management. Examines problems posed by changing work patterns, labor force characteristics, union activities, and government policies. Discusses and evaluates organizational experiments such as worker participation, job enlargement, and group incentives from a managerial perspective. *Prereq.* HRM 1432 or HRM 1433; *middler standing.*

HRM 1345 Contemporary Labor Issues

4 QH

Studies current issues dealing with labor in its broadest sense. Discusses and evaluates labor unions and manpower institutions as well as the emerging development and training problems motivated by unemployment, poverty, and changing work patterns. Reviews recent legislation dealing with the employment relationship. *Prereq.* HRM 1431 or HRM 1433.

HRM 1348 Reward Systems: Wage, Salary, and Benefits Administration

4 QH

Examines one of the major functions of personnel administration — compensation management — and its part in the overall personnel programs of the organization. Develops through simulation exercises, group projects, lectures, and cases an analysis of reward systems as supportive mechanisms of management and the formulation of compensation policy and implementation of compensation systems. *Prereq.* HRM 1431 or HRM 1433.

HRM 1349 Selection and Assessment of Employees

4 QH

Examines three influences of employee selection and testing: the legal aspect of selection, where the greatest uncertainty is found; the influence of industrial psychology on selection and decision-making techniques; and the area of personnel practices itself, that is, the methods employers find effective in coping with legal requirements. Covers basic issues and procedures such as EEO, decision strategies, and the utility and evaluation of selection and appraisal systems. *Prereq.* HRM 1432 or HRM 1433.

HRM 1431 Complex Organizations

4 QH

Examines the structure and dynamics of the complex organization. Focuses on the design of the organization and its basic subsystems (reward, control, selection, development). Explores how organizational structures help shape human behavior. Emphasizes understanding the interrelations among organizational structures, tasks, and individual characteristics within the context of a changing environment. *Prereq.* *Middler standing.*

HRM 1432 Organizational Behavior

4 QH

Explores the effects of individual, interpersonal, group, and leadership factors on human behavior. Also explores managerial applications of behavioral and social science concepts, including job design, job satisfaction, performance appraisal, supervision,

career dynamics, and organizational change. Emphasizes helping the student develop skills in dealing with the human side of enterprise. *Prereq.* *Middler standing.*

HRM 1433 Organizational Behavior and Design

4 QH

Covers the material from HRM 1431 and HRM 1432. The structure and dynamics of the complex organization are examined, focusing on the design of the organization and its basic subsystems. The effects of individual, interpersonal, group, and leadership factors on human behavior are also examined. Students have the opportunity to explore how organizational structures help shape human behavior and to develop skills in dealing with the human side of enterprise. *Prereq.* *Middler standing.*

HRM 1504 Strategies of Organizational Changes

4 QH

Focus on three basic areas: organizations as stable systems that naturally resist both planned and unplanned change; organizations as dynamic systems that continuously respond to both internal and external pressures for change; and strategies and techniques for designing, implementing, and managing change. Discusses the role of the change agent in this context. *Prereq.* HRM 1431 or HRM 1433.

HRM 1508 Participative Management

4 QH

Participative management refers to a range of techniques that may enhance employee involvement in decision making. These methods take a variety of forms and are used in many different settings with mixed results. This course studies the motivational basis for participative programs, describes the forms and techniques available, and examines criteria for evaluating effectiveness. This course also considers internal and external organizational factors that may affect overall success of participation and discusses cultural and social aspects of participative management in an international business environment. *Prereq.* HRM 1431 and HRM 1432 or HRM 1433.

HRM 1512 Motivation and Control

4 QH

Extensively analyzes various theories of motivation, including Herzberg's two-factor theory, expectancy theory, learning theory, need theory (McClelland), and competence motivation. Also considers the behavioral implications of various organizational systems of measuring and controlling operations. *Prereq.* HRM 1431 or HRM 1433.

HRM 1519 Leadership

4 QH

In this course, the leadership function in a variety of organizational settings is studied. Using a contingency approach, students explore a range of possible leadership behaviors, relating the appropriateness of a particular style to a number of situational factors. Readings provide an opportunity to explore several contingency theories of leadership; cases allow for the application of these models; and videotaped role

playing and self-assessment techniques permit students to evaluate their own leadership style. *Prereq.* HRM 1431 or HRM 1433.

HRM 1539 Managing Careers

4 QH

Surveys the tools for both self-assessment (investigating one's skills, abilities, needs, values, and interests) and career exploration (determining the nature of and requirements for entering and succeeding in various career fields). Helps students develop an individualized plan of action that summarizes a wide variety of data indicating an individual's present status and career goals and the means by which to bridge the gap. *Prereq.* HRM 1431 or HRM 1433.

HRM 1581 Managerial Skills Seminar

4 QH

Studies and develops specific behavioral and interpersonal skills critical for managerial success, particularly those most vital early in management careers, in a seminar/workshop format. Uses introspective and experiential exercises and role plays extensively and discusses specific work assignments. *Prereq.* HRM 1432 or HRM 1433 and satisfaction of middler-year writing requirement.

HRM 1583 Seminar in Collective Bargaining

4 QH

Focus is on the organization, negotiation, and administration of collective-bargaining relations between management and unions in different industries, services, and levels of government. Simulations of actual bargaining and an arbitration exercise are also a part of the course. *Prereq.* HRM 1431 or HRM 1433.

HRM 1585 Managing Human Resources: The Legal Environment

4 QH

Studies the recent legal developments affecting the management of human resources. Examines recent state and federal laws that will influence managerial policies and practices in areas such as employment testing, hiring and promotion, controlling unemployment compensation and Worker's Compensation claims, and responding to OSHA and ERISA regulations. *Prereq.* Middler standing.

HRM 1591 Independent Study

1 QH

This course is for the student who has received approval to undertake independent study in lieu of any course required in the various concentrations. Students present proposals to an Independent Studies Committee for evaluation and approval. Every

proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study will take place. A copy of the final report prepared by the student will be presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from area coordinators.

HRM 1592 Independent Study

2 QH

Same as HRM 1591.

HRM 1593 Independent Study

3 QH

Same as HRM 1591.

HRM 1594, HRM 1595, HRM 1596, HRM 1597 Independent Study

4 QH

Same as HRM 1591.

HRM 1760 International Labor Relations Systems

4 QH

Analyzes labor relations systems of selected countries in comparison with that of the United States. Also studies the political, cultural, and economic forces that shaped these systems. Gives special attention to such international institutions as multinational companies and the EEC. Cases, readings, and projects assigned. *Prereq.* HRM 1431 or HRM 1433.

HRM 1762 Managing People in International Settings

4 QH

Covers basic issues in human resources management relevant to managing in international and cross-cultural environments. Examines selection and training of personnel for work in multicultural environments, managing the international employee in the United States and abroad, cross-cultural communication, international environments, special issues of concern to small business, and change in multinational companies. *Prereq.* Junior standing.

HRM 1891 Honors Thesis in Progress

0 QH

HRM 1892 Honors Thesis

8 QH

HRM 1893 Honors Thesis in Progress

0 QH

HRM 1894 Honors Thesis

12 QH

International Business Administration

INB 1338 Introduction to International Business

4 QH

Focus is on the cultural, economic, and political aspects of domestic and foreign environments and their effect on the international operations of business firms. Topics include the principles, patterns, and potential of international trade and investments; the development of management strategies for international businesses; and the organization and management of the firm's international operations. *Prereq.* Middler standing.

INB 1352 Seminar in International Business

4 QH

The concepts and skills acquired in other international and domestic courses are applied to the solution of managerial problems. Focus is on the task of solving significant managerial problems in international and foreign cultural contexts. Students' reports form a major part of this course and are expected to concentrate either on a functional business area related to international operations or on analyses of market opportunities and methods

of entry in a foreign environment. Other instructional vehicles include case analyses and discussions of current issues. *Prereq.* INB 1338 and senior standing.

INB 1731 Cultural Aspects of International Business 4 QH

Covers, from a managerial perspective, issues that arise when a firm moves from its home country to a host country that may have a different national culture. Focuses on United States-based firms that operate abroad. Also considers what happens to other nation's firms operating in the United States and in third-country environments. Analyzes how "corporate culture" evolves in the context of national

culture and the impact on managers. *Prereq.* Middler standing.

INB 1802 Regional Topics in International Management (Honors) 4 QH

Focuses in depth on management in three very different, rapidly changing managerial environments: Europe in 1992, the less developed countries of Asia and Africa, and Eastern Europe. Uses case analysis, audio-visual material, and guest speakers to explore issues that managers face and especially how they operate in an environment of uncertainty and turbulence. *Prereq.* Honors participation or permission of instructor.

Management

MGT 1115 Introduction to Business 4 QH

Introduces the basic functions of management, team-taught by faculty from all areas of the College of Business Administration. Examines academic choices and career opportunities in business.

MGT 1345 Legal Aspects of Business 4 QH

Examines the legal aspects of business transactions and business relationships involving contracts and sale of goods under the Uniform Commercial Code, as well as product liability and agency law.

MGT 1446 Managing Social Issues 4 QH

Analyzes environmental influences — economic, legal, technical, social, cultural, and ethical — affecting the corporation. Focuses on managerial decision making that will make the most effective use of the opportunities created by these external factors. *Prereq.* HRM 1431 or HRM 1433; junior standing.

MGT 1450 Business Policy 4 QH

Focuses on corporate strategy and its elements, including an analysis of the company, its resources, opportunities, environment, and decision makers. Emphasizes decision making and implementation of strategy while operating a company in the context of a business simulation. *Prereq.* Senior standing.

MGT 1571 The Law of Business Organizations and Commercial Paper 4 QH

Introduces the legal aspects of the typical forms of business organizations, partnerships, corporations, and the rights, responsibilities, and liabilities involved. Also covers the law governing commercial paper under the Uniform Commercial Code, and the Bankruptcy Reform Act of 1978. *Prereq.* MGT 1345 and middler standing.

MGT 1572 Law of Wills, Trusts, and Estates 4 QH

Examines requirements of valid will, claims of and against estates; the administration of estates, both formal and informal; essential elements for the creation of a trust; kinds of trusts, including inter vivos and testamentary trusts; the rights, responsibilities, and liabilities of trustees; and the rights of beneficiaries. *Prereq.* Middler standing.

MGT 1573 Bulk Sales and Bankruptcy 4 QH

Examines bulk transfers, with detailed study of the Uniform Commercial Code, Article 6; the need of the transferor to give to the transferee a sworn list of all his creditors; the giving of notice to the listed creditors; the contents of the notice, what creditors are protected; and the legal consequences of failure to comply with the Code. Also deals with both voluntary and involuntary bankruptcies; the appointment and duties of the trustee; provable and dischargeable debts; priority of debts; discharge and acts that bar a discharge. *Prereq.* Middler standing.

MGT 1574 Law in Society 4 QH

Provides students the opportunity to acquire a broad view of their legal rights, obligations, and responsibilities in their relations with others and with the state. Includes study of torts, such as assault and battery, trespass, negligence, slander, libel, and deceit, and crimes such as homicide, assault and battery, robbery, arson, larceny, and burglary. *Prereq.* Middler standing.

MGT 1575 Negotiations 4 QH

Focuses on broadening the students' understanding of the negotiations process, emphasizing the strategies and techniques that might be employed in that process. Includes familiarization with related literature, student role playing, and interaction with professionals involved in private- and public-sector negotiations.

MGT 1591 Independent Study 1 QH

This course is for a student who has received approval to undertake independent study in lieu of any course required in the various concentrations. Students present proposals to an Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study will take place. A copy of the final report prepared by the student will be presented to the appropriate Independent Studies Committee. Further information about

the Independent Studies Program can be obtained from area coordinators.

MGT 1592 Independent Study 2 QH
Same as MGT 1591.

MGT 1593 Independent Study 3 QH
Same as MGT 1591.

MGT 1594, MGT 1595, MGT 1596, MGT 1597 Independent Study 4 QH
Same as MGT 1591.

MGT 1720 Labor Law 4 QH
Helps acquaint the student with the many constitutional and legal problems involved in labor organizing, industrial relations, labor negotiations, labor contract enforcement, and dispute resolution. Examines cases for the legal principles underlying the common law, state and federal laws, and the constitutional questions of power and authority. Also considers the Sherman Act, Clayton Act, Norris-LaGuardia Act, and Labor Management Relations Act. *Prereq. Middler standing.*

MGT 1808 Honors: Seminar on the Management of Innovation 4 QH
The management of technological innovation is of critical importance to American companies as they face increasing worldwide competition. Knowledge in the area is advancing rapidly and incorporates work from several disciplines, including strategy, marketing, organizational behavior, and finance. This course will be run as a research seminar. Students will be responsible for identifying relevant topics in the management of innovation and completing a research study. Students can work either individually or in small groups on the research topic they define. Students will be required to submit a research proposal, a progress report at mid-quarter, and a final paper and presentation. *Prereq. Honors participation or permission of instructor.*

MGT 1819 Honors: Seminar in Research 4 QH
Focuses on the definition of research in the context of the business environment, research methodologies, and the student's attempt at research through a term project. Analyzes the formulation of concepts, hypotheses, and theories; the design of research projects; data collection; data analysis; and report writing. Involves a term project that investigates a subject of interest to the student and that is intended to serve as a prototype of honors thesis. *Prereq. MSC 1201.*

MGT 1820 Honors: Independent Study 4 QH
Offers directed study toward fulfillment of Honors Program requirements and is open only to students who have been accepted into the Honors Program. Procedures for arranging the honors independent study are the same as those for MGT 1594.

MGT 1828 Honors: Legal Environment of Business 4 QH
Examines significant legal issues confronting the corporate community through cases, readings, and videotapes. Topics include discrimination in employment, protection of workers, product and service liability, antitrust law, and the law of business organizations. Provides practical legal advice for potential managers. *Prereq. Honors participation or permission of instructor.*

MGT 1891 Honors Thesis in Progress 0 QH

MGT 1892 Honors Thesis 8 QH

MGT 1893 Honors Thesis in Progress 0 QH

MGT 1894 Honors Thesis 12 QH

Marketing

MKT 1331 Marketing Management 4 QH
Provides training in marketing decision making. Uses case studies simulating actual business settings to help students develop analytical abilities and sharpen their communications skills. Covers topics that range from techniques used to analyze a market to the development of a total marketing strategy (product policy, pricing policy, promotion policy, and distribution policy). *Prereq. MKT 1435 and middler standing.*

MKT 1341 Marketing Research 4 QH
Focuses on the survey research process and the analysis of data using "canned" computer programming routines. Covers topics such as problem definition, research design, sampling techniques, questionnaire development, data collection methods, and data analysis. Students expected to work on group projects

with participating firms. Requires no previous computer experience. *Prereq. MKT 1331 and MSC 1201.*

MKT 1351 Competitive Strategy 4 QH
This course is a capstone marketing course, required of all students with a marketing concentration. The focus is on the formulation of marketing strategy at a policy level and its implementation in a dynamic environment. *Prereq. MKT 1331, MKT 1341, and senior standing.*

MKT 1435 Introduction to Marketing 4 QH
Consists of lectures, readings, and small-group discussions on the role of marketing in contemporary society, in the business enterprises, and in the non-profit organization. Considers the planning, operation, and evaluation of marketing and promotional

efforts necessary to the effective marketing of consumer and industrial products and services in both profit and nonprofit organizations. *Prereq. Middler standing.*

MKT 1501 Introduction to Retailing 4 QH

Explores the range of retail firms that make up the retailing industry, from large mass merchandisers to small specialty outlets. Examines the functions, practices, and organizations of various store types. Considers such topics as current issues, career opportunities, the environment of retailing and retailing's role in the economy. *Prereq. Middler standing.*

MKT 1503 Retail Merchandising and Control 4 QH

Examines the concepts and techniques of store operations and merchandise management. Considers topics such as calculating and planning markups and markdowns, pricing, inventory control, stock turn, open-to-buy, profitability analysis, and expense control. *Prereq. MKT 1435 or permission of instructor.*

MKT 1504 Fashion Retailing 4 QH

Provides an understanding and appreciation of the dynamics and multidimensional nature of the fashion business. Uses assigned readings and projects to examine how the fashion industry functions and how fashion is produced and merchandised. Simulates functions of the retail buyer. *Prereq. MKT 1435 or permission of instructor.*

MKT 1507 Retail Strategies and Problems 4 QH

Considers strategic and policy decisions of major retail enterprises engaged in food, apparel, and general merchandise distribution. Analyzes the evolution of retail institutions along with the characteristics of and prospects for new store types. *Prereq. MKT 1435; junior or senior standing or permission of instructor.*

MKT 1512 Marketing for Nonprofit Organizations 4 QH

Examines the unique characteristics of marketing in public and nonprofit enterprises. Aims to expand the scope of marketing management concepts beyond the traditional setting of business. Pays particular attention to the basic decision-making differences between public and private firms. Involves case analysis, assigned readings, and a group project. *Prereq. MKT 1331 and middler standing.*

MKT 1513 Direct Marketing 4 QH

Direct marketers use direct response advertising to generate immediate, measurable responses—either direct sales or requests for more information—from their prospects and customers. Focus is on starting and managing mail-order catalog businesses; conducting consumer and business-to-business direct mail campaigns; preparing telemarketing programs; and creating newspaper, magazine, radio, and television direct-response advertising. *Prereq. MKT 1331 and middler standing.*

MKT 1515 Marketing in the Service Sector 4 QH

Presents a basic treatment of methods and techniques for marketing in the service sector, which includes sports, recreation, public service, banking,

insurance, and hotels. Also analyzes a number of descriptive studies covering the application of such marketing principles in key service areas. *Prereq. MKT 1331 and middler standing.*

MKT 1523 Advertising Management 4 QH

Focuses on the management of the advertising function in relation to a firm's overall marketing objectives. Approaches the subject from the perspective of the user of advertising (for example, the product manager and the marketing manager). Uses case studies and text material to help the student develop decision-making skills. *Prereq. MKT 1331 and middler standing.*

MKT 1531 Sales Management 4 QH

Helps the student develop decision-making skills necessary for both building and maintaining an effective sales organization. Uses cases and readings to examine the strategic and operating problems of the sales manager. Includes such major topic areas as the selling function, sales management at the field level, and the sales executive. *Prereq. MKT 1331 and middler standing.*

MKT 1536 Brand Management 4 QH

Focuses on the management and development of brand strategies as well as the management of the product mix in the multi-product firm. Includes such topics as evaluating and planning new consumer product introductions, identifying and screening new product opportunities, evaluating market performance, segmenting the product/market, and managing the product line. *Prereq. MKT 1331 and middler standing.*

MKT 1540 Marketing Channels 4 QH

Studies marketing structures and institutions: their evolution, functions, interrelations, and the management of their role in the marketing process. *Prereq. MKT 1435 or permission of instructor; junior or senior standing.*

MKT 1542 Industrial Marketing 4 QH

Examines the marketing of products where business firms are the potential customers. Upperclass elective, open to juniors and seniors. *Prereq. MKT 1331 and middler standing.*

MKT 1545 New Product Development 4 QH

For most firms, coping with the problems of environmental change through modification of the product line is both vital and difficult. This seminar is concerned primarily with the examination and analysis of the problems firms face in directing and managing their new product development activities. *Prereq. MGT 1450.*

MKT 1547 Marketing in High-Tech Industries 4 QH

For students who already have a good background in marketing and who are interested in analyzing the special marketing problems that high-tech industries pose. Includes such topics as the use of market research when customer preferences are not yet developed and the use of marketing as a strategic variable. *Prereq. MKT 1331.*

MKT 1553 Foundations of Consumer Behavior 4 QH

Helps students develop an understanding of consumer attitudes and behavior processes as the basis of the design of marketing problems. Considers economic and behavioral models of consumer behavior and underlying behavioral theories and concepts. *Prereq.* MKT 1331 and middler standing.

MKT 1560 Marketing Information and Decision 4 QH

Surveys state-of-the-art marketing information systems and computer-based business aids. Explores their applicability to various marketing management situations. Provides hands-on experience through the use of actual business case studies. *Prereq.* MKT 1331, junior or senior standing, or permission of instructor.

MKT 1573 Workshop in Negotiations 4 QH

Helps students improve their understanding of the negotiations process and their ability to plan and conduct negotiations effectively. Involves readings, lectures, and discussions, as well as numerous case discussions and live and videotaped role-play negotiation exercises. *Prereq.* Junior or senior standing.

MKT 1580 Quantitative Methods in Marketing 4 QH

Focuses on statistical methods and techniques commonly used in the analysis and interpretation of survey and experimental data. Uses "canned" computer programs to illustrate the applicability of the methods discussed. Requires no previous computer experience. *Prereq.* MSC 1201.

MKT 1591 Independent Study 1 QH

This course is for the student who has received approval to undertake independent study in lieu of any course required in the various concentrations. Students present proposals to an Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study will take place. A copy of the final report prepared by the student will be presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from area coordinators.

MKT 1592 Independent Study 2 QH

Same as MKT 1591.

MKT 1593 Independent Study 3 QH

Same as MKT 1591.

MKT 1594, MKT 1595, MKT 1596, MKT 1597 Independent Study

Same as HRM 1591.

4 QH

MKT 1735 Honors: Introduction to Marketing

4 QH

Explores the role of marketing in contemporary society, business enterprises, and nonprofit organizations through lectures, readings, and small group discussions. Considers planning, operating, and evaluating marketing and promotional efforts that are necessary to effectively market consumer and industrial products and services in both profit and nonprofit organizations. *Prereq.* Middler standing and honors participation.

MKT 1760 International Marketing

4 QH

Introduces those aspects of marketing that are unique to international business within the framework of traditional functional areas of marketing. Focuses on the environment and the modifications of marketing concepts and practices necessitated by environmental differences. Includes such topics as cultural dynamics in international markets, political and legal environmental constraints, educational and economic constraints, international marketing research, international marketing institutions, and marketing practices abroad. *Prereq.* MKT 1435 and middler standing.

MKT 1807 Honors: Analysis of Survey Data

4 QH

Focuses on the most widely used techniques for analyzing survey data and discusses some of the problems researchers face in their attempts to obtain high-quality, reliable information. Opportunities to analyze data from previously collected surveys and to prepare summary reports that succinctly summarize the major findings.

MKT 1809 Honors: The Marketing and Sales Executive

4 QH

Introduces the skills required of a senior marketing and sales executive. Focuses on the importance of sales management in implementing overall marketing strategy. Emphasizes practical theories and approaches for improving the total effectiveness of the marketing/sales function. *Prereq.* Honors participation or permission of instructor.

MKT 1891 Honors Thesis in Progress

0 QH

MKT 1892 Honors Thesis

8 QH

MKT 1893 Honors Thesis in Progress

0 QH

MKT 1894 Honors Thesis

12 QH

Management Science

MSC 1200 Business Statistics I 4 QH

Studies statistics, which is the methodology concerned with data collection, analysis, and interpretation. Discusses the information that is generated by statistical methods and used for analyzing decisions in the face of uncertainty. Introduces fundamental concepts and methodology of probability,

probability distribution, Bayesian revisions, estimation, and hypothesis testing. *Prereq.* MTH 1114.

MSC 1201 Business Statistics 2

4 QH

Continues topics covered in MSC 1200. Includes chi-square tests, simple and multiple regression-correlation analysis, and elementary concepts of decision theory. *Prereq.* MSC 1200.

MSC 1226 Computer-Based Information Systems 4 QH

Introduces computer-based information systems. Covers topics such as the hardware, software, and systems used to aid in the solution of modern business problems and the methods used to store, retrieve, and communicate information. Provides hands-on experience with several contemporary business software packages. Through a project, gives the student an appreciation for the problems and benefits associated with utilizing modern information technology and systems. *Prereq.* *Sophomore standing.*

MSC 1331 End User Computing 4 QH
(Formerly MSC 1562)

Investigates the capabilities of several more advanced software packages available on both main-frame and personal computers. Covers such topics as database management systems, financial modeling systems, and telecommunications. Includes a project dealing with the evaluation of hardware and software for business environments. *Prereq.* *MSC 1226 and middler standing.*

MSC 1339 Business Programming I 4 QH
(Formerly MSC 1352)

An introduction to structured COBOL programming. Covers documentation techniques, record and file layouts, manipulation of sequential files, error detection, table-handling techniques, complex IF statements, COBOL arithmetic, manipulation of character strings, and debugging techniques. *Prereq.* *MSC 1226 and middler standing.*

MSC 1340 Business Programming 2 4 QH
(Formerly MSC 1353)

Continues MSC 1339. Covers advanced topics such as user-defined functions, parameter passing, and modular coding. Explores ways to integrate third-party library routines into computer code. Focuses on design and programming walkthrough techniques. *Prereq.* *MSC 1331, MSC 1339, and junior standing.*

MSC 1349 Systems Analysis and Design 4 QH

Covers concepts and techniques in systems analysis and design, including the systems development life cycle, prototyping, systems design techniques, the role of the systems analyst, project management, and the efficient use of available resources and technology. *Prereq.* *MSC 1339.*

MSC 1350 Database Management Systems 4 QH

Discusses the use of database management systems (DBMS) for business data processing and MIS. Covers the principles of database design, using the hierarchical, network, and relational data models. Includes other topics such as normalization, the data dictionary, query languages, forms management software, fourth-generation software environments, and distributed DBMS concepts. Provides practical experience in using a DBMS implemented on the University's computers. Explores management issues in the implementation and control of DBMS. *Prereq.* *MSC 1340 and MSC 1349.*

MSC 1351 Management Information Systems 4 QH

(Formerly MSC 1571)

Analyzes the dynamic nature of effective information systems in supporting decision making in organizations. Uses both text and cases to present a framework for developing, managing, and using the information resources of the organization. Topics include strategic planning for information systems, meeting the information needs of the various functional areas of management, office automation, the information center, decision support systems, distributed processing, security and privacy issues, artificial intelligence, expert systems, and organizational and political problems associated with managing information. *Prereq.* *MSC 1350 and senior standing.*

MSC 1433 Quantitative Models in Business 4 QH

Focuses on the construction of appropriate mathematical models (simplified representations or abstractions of reality) for managerial decision-making problems. Discusses criteria for selecting various stochastic and deterministic models. Specifically covers decision trees, decision analysis, linear programming, and simulation. *Prereq.* *MSC 1201.*

MSC 1441 Operations Management 4 QH

Considers the productive system of an enterprise whereby inputs of technology, materials, personnel, and information are transformed into useful goods and/or services. Introduces the types of problems and issues encountered by the operations manager. Discusses various models and techniques but emphasizes problem formulation and managerial implications. *Prereq.* *MSC 1201.*

MSC 1501 Purchasing and Materials Management 4 QH

Examines decisions related to the flow of materials from supplier to point of use. Emphasizes problems related to purchasing, including negotiation, value analysis, and supplier selection. Emphasizes materials management in manufacturing organizations, but also covers nonprofit and nonmanufacturing concerns. Applies latest research in field gleaned from projects sponsored by the National Association of Purchasing Management and the American Production and Inventory Control Society. *Prereq.* *MSC 1441.*

MSC 1511 Operations Planning and Control 4 QH

Focuses on the planning and control necessary for an enterprise to respond to customer demand. Specifically includes the design of the planning and control system, inventory planning and control, forecasting for operations planning, and operations scheduling. *Prereq.* *MSC 1441.*

MSC 1523 Production Management 4 QH

Continues MSC 1441. *Prereq.* *MSC 1441.*

MSC 1553 Decision Analysis 4 QH

Focuses on the analysis of decision making, with particular emphasis on realistic problems under uncertainty. Aims to help improve the student's ability to make better decisions through a careful consideration of alternative courses of action and their consequences, relevant objectives, and the element of risk. Covers the basic components of decision problems,

the concepts of risk and utility, decision trees, and value of information and multicriteria decision-making. *Prereq.* MSC 1201.

MSC 1564 High-Technology Operations Management 4 QH
High-technology industries are usually characterized by greater degrees of innovation and faster rates of obsolescence of products and capital equipment than other industries. In addition, they are supported by manufacturing operations that are at the early phases of the learning curve. In this course, the importance of these factors and the application of the tools and techniques of operations management to firms operating in a high-technology environment are discussed. It is recommended for students interested in careers in high-technology manufacturing industries, as analysts for venture capitalists, and as consultants. *Prereq.* MSC 1441.

MSC 1575 Negotiations 4 QH
Focuses on broadening the students' understanding of the negotiations process, while exploring such issues as the strategies and techniques that might be employed. Surveys related literature. Relies heavily on student role playing and interaction with professionals involved in private and public sector negotiations. *Prereq.* Middler standing.

MSC 1591 Independent Study 1 QH
This course is for the student who has received approval to undertake independent study in lieu of any course required in the various concentrations. Students present proposals to an Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a

supporting statement from the supervising faculty member under whose direction the study will take place. A copy of the final report prepared by the student will be presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from area coordinators.

MSC 1592 Independent Study 2 QH
Same as MSC 1591.

MSC 1593 Independent Study 3 QH
Same as MSC 1591.

MSC 1594, MSC 1595, MSC 1596, MSC 1597 Independent Study 4 QH
Same as HRM 1591.

MSC 1700 Honors: Business Statistics 1 4 QH
See course description for MSC 1200.

MSC 1701 Honors: Business Statistics 2 4 QH
See course description for MSC 1201.

MSC 1726 Honors: Introduction to Data Processing 4 QH
See course description for MSC 1226.

MSC 1826 Honors: Business Forecasting
Focuses on analyzing data using statistical models from various functional areas of business. Students prepare reports based on actual data that emphasize forecasting.

MSC 1891 Honors Thesis in Progress 0 QH

MSC 1892 Honors Thesis 8 QH

MSC 1893 Honors Thesis in Progress 0 QH

MSC 1894 Honors Thesis 12 QH

Transportation

TRN 1333 The Domestic Transportation System 4 QH
Examines the structure, operations, and problems of the several modes of transportation. Outlines the government role in regulation and promotion. Also highlights the interaction between carriers and shippers in the transportation marketplace. *Prereq.* ECN 1105 and middler standing.

TRN 1344 Corporate Transportation/Logistics 4 QH
Analyzes the role and activities of those involved in corporate transportation/logistics decision making. Emphasizes the importance of transportation planning, inventory control, warehousing, customer service standards, and location decisions in the design and operation of distribution systems. *Prereq.* Junior standing.

TRN 1353 Seminar in Transportation and Logistics 4 QH
Focuses on a limited number of advanced transportation/logistics topics. Offers students experience with business and government through individual research on topics selected for class presentation/discussion. *Prereq.* Senior standing.

TRN 1514 Carrier Management 4 QH
Examines the perspective of those involved in managing the several modes of transportation. Emphasizes the decision-making process related to such issues as carrier financing, pricing, labor relations, and equipment selection. *Prereq.* TRN 1333.

TRN 1528 Urban Transportation 4 QH
Focuses on the movement of people and freight in and around metropolitan areas. Examines the role of transit managers in planning, implementing, and operating mass transit systems. Also outlines how various governmental units participate in financing and regulating urban transportation. *Prereq.* Middler standing.

TRN 1591 Independent Study 1 QH
This course is for the student who has received approval to undertake independent study in lieu of any course required in the various concentrations. Students present proposals to an Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a

supporting statement from the supervising faculty member under whose direction the study will take place. A copy of the final report prepared by the student will be presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from area coordinators.

TRN 1592 Independent Study 2 QH
Same as TRN 1591.

TRN 1593 Independent Study 3 QH
Same as TRN 1591.

TRN 1594, TRN 1595, TRN 1596, TRN 1597 Independent Study 4 QH
Same as HRM 1591.

TRN 1721 Labor/Management Issues in Transportation 4 QH
Focuses on labor in the transportation industries. Examines trends in employee compensation, produc-

tivity, bargaining patterns, and influence of government policies on labor/management issues. *Prereq.* TRN 1333.

TRN 1760 International Transportation and Logistics Management 4 QH

Examines the current and future status of ocean and air transportation in international trade and development. Also analyzes the activities of those involved in logistics planning in multinational companies. *Prereq.* *Middler standing.*

TRN 1891 Honors Thesis in Progress 0 QH

TRN 1892 Honors Thesis 8 QH

TRN 1893 Honors Thesis in Progress 0 QH

TRN 1894 Honors Thesis 12 QH

Counseling Psychology, Rehabilitation, and Special Education

CRS 1030 Introduction to Emotional Disturbances in Children 4 QH

Reviews emotional processes that interfere with learning activities; studies approaches used to deal with behavioral disorders. Emphasizes classroom management techniques, use of consultation, and parent-teacher interaction.

CRS 1200 Introduction to Special Education 4 QH

Surveys the characteristics and the social, emotional, and educational adjustment of special-needs children and youth. Evaluates the effects of society's attitudes, the individual's own attitude toward the handicap, and the effect of the handicap itself. Reviews current legislation.

CRS 1300 Introduction to Learning Disabilities 4 QH

Surveys behavioral characteristics of children who present specific deficits in perceptual, integrative, or expressive processes that impair learning efficiency. Emphasizes student evaluation, development of curriculum materials, and adaptation of teaching methods.

CRS 1301 Diagnostics in Special Education 4 QH

Focuses on developing competence in the formal and informal assessment of children's learning needs. Also emphasizes observing, recording, and analyzing children's behavior and learning environments. *Prereq.* CRS 1200 and CRS 1300.

CRS 1302 Methods and Materials of Teaching in Special Education 4 QH

Focuses on the following areas: development and implementation of individualized educational plans; task analysis; adaptation and selection of materials; strategies in applied classroom management techniques; and adaptation and selection of materials and strategies in language arts, mathematics, and perceptual-motor skills. *Prereq.* CRS 1200, CRS 1300, CRS 1301, or senior status.

CRS 1304 Socio-Psycho Dynamics of Family Life 4 QH

Introduces and surveys the internal and external dynamics of family life. Examines the significance of such dynamics to the mental health of the special needs child. Explores approaches to working with parents in home-school relationships, as well as the effects of disability on the family.

CRS 1305 Psychology of the Mentally Retarded 4 QH

Analyzes the etiology, nature, and needs of the retarded individual, emphasizing cognitive and psychosocial development. Explores the implications of these characteristics for life-span management in conjunction with parental and community attitudes and involvement.

CRS 1306 Introduction to Rehabilitation 4 QH

Surveys the field of rehabilitation, including its historical development, psychological implications, and sociological dimensions. Pays special attention to rehabilitation of specific disability groups, such as the physically disabled, the emotionally disturbed, the mentally retarded, alcoholics, drug dependents, and public offenders.

CRS 1310 Intervention Strategies for the Human Services 4 QH

Introduces the wide range of skills used in working with clients in the various helping professions, for example, counseling (individual and group), advocacy, rehabilitation, community organizing, and income maintenance. Utilizes role playing, simulations, and interviews with practicing professionals. Also requires readings, but no fieldwork. Intended as preparation for more specialized courses; required for Human Services majors but open to other students with appropriate backgrounds.

CRS 1311 Case Management: 4 QH**Diagnosis and Treatment**

Introduces the basic theory and skills of managing client's treatment programs in a variety of institutional settings. Provides training in the identification of the components of a psychosocial assessment, examination of common techniques of planned service delivery and resource coordination, and review of the diverse entitlements available to clients of diverse needs and backgrounds. Utilizes a seminar-like format. *Prereq.* PSY 1111 or SOC 1100.

CRS 1312 Introduction to Family 4 QH
Systems Counseling

Introduces the concepts and skills of family systems therapy, a counseling orientation in which the family is the chosen social unit of assessment and intervention for the client's problem. Covers major approaches within communications and structural frameworks, emphasizing implications for normal family development and interventions in dysfunctional systems. Addresses theory and strategies for working with marital and parenting subsystems. Offers students a beginning opportunity to experience how their family affects their professional functioning in various social systems.

Prereq. CRS 1314.

CRS 1313 Introduction to Group Counseling 4 QH

Provides a foundational exposure to the theory and skills of group counseling as practiced in various human service settings. Covers developmental stages of counseling groups: approaches to leadership style, and strategies for starting, maintaining, and terminating the counseling group. Includes an opportunity for students to practice rudimentary

skills of leadership of counseling groups and to become involved in focused group-process activities. *Prereq.* CRS 1314.

CRS 1314 Introduction to Counseling 4 QH

Surveys major theoretical approaches to counseling. Provides training and practice in listening skills to aid in the development of facilitative responses. Combines didactic presentations and experiential activities to assist students in understanding and implementing a variety of counseling approaches.

CRS 1317 Student Teaching and Seminar 8 QH
in Special Education

Allows for full-time participation in a University-arranged and supervised school program. Gives the student the opportunity to analyze the teaching of and the learning by special-needs students and to demonstrate, evaluate, and develop teaching skills in a variety of classroom settings. *Prereq.* Formal acceptance into and completion of advanced professional sequence with minimum 2.0 Q.P.A. both overall and in teaching major.

CRS 1800 Directed Study 4 QH

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. Directed Study requires approval of the supervising faculty member and of the dean's office of the Boston-Bouvé College of Human Development Professions. Approval forms must be submitted to the dean's office during the quarter prior to registration for the directed study. *Prereq.* Permission of instructor.

Education

ED 1003 Reading/Study Skills 1 4 QH

Provides instruction to students who demonstrate a need to be more efficient in comprehending and studying college textbooks and collateral reading assignments. Concentrates on techniques involved in understanding informative materials and introduces the evaluation of persuasive prose. In addition, presents suggestions on such topics as how to listen to and take summary notes on course lectures and how to set study goals and priorities consistent with course objectives.

ED 1004 Reading/Study Skills 2 4 QH

Continues topics introduced in ED 1003 and expands upon the analysis and interpretation of persuasive texts. Emphasizes reading imaginative prose for meaning and pleasure, preparing for and taking examinations, and learning to adjust reading speed and method to various materials encountered in current courses.

ED 1005 Practicum in Reading and Study Skills 4 QH

Gives students in the academic program Project Ujima comprehensive tools to help them to master

the how-to's of reading textbooks, notetaking, outlining, introductory research skills, time management, studying skills, and other techniques necessary for success in college.

ED 1100 Education and Social Science 4 QH

Draws on anthropology, psychology, and sociology, and some of the concepts, methods, and terminology of those fields. Concentrates on the evolution of human nature, the influence of previous experience and learning on the behavior of individuals and groups, the difficulties in achieving a full degree of humanity in a technological society, and the potentially powerful roles that "professional socializers" (teachers, clinicians, group leaders, and so forth) can play in the lives of students and clients.

ED 1101 Education for the Future: 4 QH
A Creative and Humanistic Approach

Gives students the opportunity to gain a perspective on the array of conflicting learning experiences that bombard their lives; to identify the factors that influence what people learn and from whom; and to evaluate the potential effects of these learnings.

Encourages students to develop frames of reference through which to examine their own roles in the education process. Utilizes a creative and humanistic approach to teaching.

ED 1102 Human Development and Learning 1 4 QH

Surveys developmental processes from the prenatal period through preadolescence. Covers principles of physical, cognitive, language, social, and personality development and discusses the implications for childrearing and schooling.

ED 1103 Human Development and Learning 2 4 QH

Presents a basic overview of the continuity of human development in contemporary society, from the pre-adolescent period through adolescence, adulthood, middle age, and old age. Considers significant areas of growth, development, and adjustment for each period, including social, sexual, personality, motivational, and cognitive aspects.

ED 1104 Analysis of the Instructional Process 4 QH

Examines conflicting theories about the nature of teaching and learning. Evaluates the effects of traditional and innovative educational systems on learners. Identifies educational tools for describing, analyzing, and evaluating aspects of learning and teaching; refines students' use of those tools during sequential field observations and class meetings. Requires fieldwork.

ED 1105 Day Care and Nursery Schools: Social and Cultural Origins. 4 QH

Explores the origins of the increased contemporary use of out-of-the-family child care arrangements in the United States and in selected European and third-world nations. Covers the interrelation of industrialization, technology, and family functioning; contrasting varieties of child care centers in operation today; and effects of the proliferation of child care centers on other aspects of society, such as neighborhood life, business, parents' lifestyles, elementary school curricula, government spending, and the job market in education and human services. Requires three to four hours per week of fieldwork in child care. *Prereq. ED 1100 or equiv.*

ED 1106 Creative Expression in Children 4 QH

Assists students who are interested in working with children in a variety of settings. Focuses on the potential of creative expression in interpersonal communication and the relation of children's creative experiences to their cognitive, emotional, and social development. Provides the opportunity to acquire the hands-on experience and confidence to work with various media available for creative expression. *Prereq. ED 1102.*

ED 1300 Education and Psychosocial Development 4 QH

Examines theories and research on the socialization functions of education. Covers the relative influence of early versus postchildhood socialization and the role of diverse educational experiences and institutions in personality development. *Prereq. ED 1100 or equiv.*

ED 1301 Educational Applications of Social Psychology 4 QH

Focuses on theory and research in social psychology especially relevant to education. Covers prejudice in the classroom; the school as a setting for manifestation of authoritarian personality, attitude organization, and change in an educational environment; the class and the clique as small groups, the expression of need for achievement in various school structures; and other related topics. *Prereq. ED 1102 or ED 1103.*

ED 1302 The Human Services Professions 4 QH

Explores what a human service agency is, how it comes into being, how it grows and changes. Analyzes attitudes, values, skills, and knowledge of the human services worker and the reasons why people in modern society require human services assistance. Views human services from the eyes of clients as well as society as a whole. Requires fieldwork in a human service agency as well as a good deal of independent study. Required for all human services majors; open to other students on space-available basis. *Prereq. ED 1100, SOC 1100, or equiv.*

ED 1303 Mental Health in Teaching 4 QH

Investigates the factors involved in the choice of teaching as a career and the psychological and occupational factors that contribute to teacher happiness, dissatisfaction, adjustment, and maladjustment. Examines what teachers can do to foster healthy personalities, how to deal with psychological forces in the classroom, and how to strengthen the emotional development of the normal child. *Prereq. ED 1102 or ED 1103.*

ED 1304 Language and Cognition: Educational Implications 4 QH

Focuses on the development of language and thought in the child. Includes such topics as concept attainment and problem solving and the relationship of language to cognitive functioning. Gives particular consideration to the educational implications of the material. *Prereq. ED 1102 or ED 1103.*

ED 1305 Cross-Cultural Studies of Child Rearing and Education 4 QH

Examines child rearing and child life in contrasting cultures around the world. Emphasizes cognitive, emotional, and behavioral outcomes of concern to American educators, human services workers, and parents. Considers alternative patterns of child rearing possibly useful in modern society. Focuses on ethnographic descriptions of particular cultures and psychological comparisons of children from contrasting backgrounds. *Prereq. ED 1102 or ED 1103.*

ED 1306 Measurement and Evaluation 4 QH

Emphasizes evaluation techniques for use in the classroom and teaching-learning situations at all levels. Explores the importance of establishing behavioral objectives as a basis for evaluation. Places considerable emphasis on improving teacher-made tests, especially objective-type tests. Requires students to construct an objective test in their discipline for an instructional unit. Also reviews other evaluation techniques besides tests. Gives brief attention to

standardized measurement instruments of ability and achievement as they may be used in the evaluation of pupil progress.

ED 1307 Introduction to Educational Statistics 4 QH

Emphasizes descriptive statistics useful in the evaluation of educational and related professional activities. Covers statistical notation, variability, probability, sampling techniques, linear regression, correlation, t-tests, and chi-square tests of significance. Draws, as much as possible, examples of applications of these techniques from the fields for which students in the course are preparing.

ED 1308 Education and Social Change 4 QH

Explores, in a sociological context, educational systems as independent and dependent variables in social change. Analyzes instances of planned educational change in various countries and their implications for contemporary American society. *Prereq. ED 1100 or equiv.*

ED 1309 Organization and Politics of School Systems 4 QH

Considers the political sociology of school systems in the United States. Analyzes the power and authority structures in contemporary education. Who decides what and how? Who controls the system? How are the various interest groups organized? What are the mechanisms for conflict resolution? Examines the relation between professional and non-professional interest groups. *Prereq. ED 1100 or equiv.*

ED 1310 Class and Ethnic Relations in Education 4 QH

Focuses on the various ways in which the American class system and patterns of ethnic group relations have affected, and have been affected by, American education. Analyzes the limitations and potential of educational institutions for resolving intergroup conflicts and the establishment of equal educational opportunities. *Prereq. ED 1100 or equiv.*

ED 1311 Schools as Social Systems 4 QH

Analyzes schools as sociocultural subsystems within the larger society. Explores functional interrelation between student and school subcultures, status and role systems, authority structures in American schools. *Prereq. ED 1100 or equiv.*

ED 1312 Comparative Education 4 QH

Compares the national school systems of selected foreign countries with the school system in the United States. Includes comparative data in the fields of teaching, speech and hearing, special education, and human services.

ED 1313 Current Issues in American Education 4 QH

Analyzes the current issues confronting teachers, speech and hearing clinicians, special education practitioners, and human services specialists. Attempts to place these issues in a historical context.

ED 1314 Philosophy of Education 4 QH

Helps participants to examine their own purposes in relation to those of the school as an institution. Studies philosophical writings on topics such as the ethics of educational intervention, the delineation of

educational concepts, the educational messages of long-range speculations and utopias, and normative assumptions underlying educational policies.

ED 1315 Seminar in Human Learning and Motivation 4 QH

Examines the relationship between human learning and motivation in the developmental process and in the classroom. Requires students to select a relevant issue, research it, and report their results to the seminar. *Prereq. ED 1102 or ED 1103.*

ED 1316 Seminar in Adolescent Psychology 4 QH

Examines in depth the motivational, intellectual, social, and emotional development of adolescents, from the end of preadolescence to the beginning of young adulthood. Gives special attention to current issues such as drug use, sexual behavior, and vocational choice. Requires each student to examine a topic of choice in some depth. *Prereq. ED 1103.*

ED 1317 Seminar in Group Process 4 QH

Studies the structure, dynamics, and function of face-to-face groups to learn about goal achievement and task orientation. Operates mainly by committee or group instrumentation. Focuses on gaining an understanding of the function of informal relationships within formal organizations, the various roles within groups, peer relationships, superior-subordinate relationships, authority and intimacy, and the inclusion and exclusion processes.

ED 1318 Seminar in Early Childhood Development 4 QH

Focuses on views of cognitive, personality, and social development during early childhood. Discusses the implications of these views. Requires each student to carry out a project in the field placement and report results to the seminar. *Prereq. ED 1102.*

ED 1400 Fundamentals of Reading 1 4 QH

Introduces developmental reading for prospective early childhood and elementary teachers. Emphasizes beginning reading as it relates to the clinical environment. Studies areas of skill development, such as word recognition and meaning comprehension, in detail, as well as some methods and techniques of testing and grouping. Also introduces some reading books and materials, methods of teaching, and the psychology of learning to read.

ED 1402 Fundamentals of Reading 2 6 QH

Continues topics introduced in ED 1400. Focuses on study skills, and speed and fluency development. Extends the tutorial work and gives the student further opportunity to achieve familiarity with books, materials, and methods. *Prereq. ED 1400.*

ED 1403 Remedial Reading 4 QH

Familiarizes prospective teachers with some of the most commonly known reading problems in the typical classroom as well as in the Reading Clinic. Analyzes and evaluates the typical diagnoses of such problems and corrective programs. Studies tutorial work with a retarded reader, with each student keeping a log or journal of work with a particular reading problem. *Prereq. ED 1402.*

ED 1404 Linguistics and Reading**4 QH**

Explores the nature of language and relevant English language systems to help students acquire a linguistic perspective on the reading process and reading instruction. Examines pedagogical implications in light of current knowledge about children's language acquisition and use. Evaluates early structural linguistic proposals for teaching reading and considers recent psycholinguistic models of the reading process. Discusses issues concerning the language-different child. *Prereq.* ED 1402.

ED 1405 Literature and Learning Materials for Children and Young Adults**4 QH**

Offers a comprehensive survey of the field of children's literature and literature for young adults. Although designed specifically for prospective teachers (and required of all Early Childhood and Elementary Education majors), may also be taken as an elective by all students. Surveys and evaluates examples of contemporary children's literature and other learning materials used in preschool, elementary, secondary, and remedial programs. Covers such recurring themes as racism and sexism in children's books, controversial books for young children, contemporary illustrators, and banned books.

ED 1406 Elementary Education Curriculum 1**4 QH**

Analyzes various patterns of organizing elementary school curriculum on the basis of the general objectives of the public school system in the United States. Requires students to evaluate and organize units of work that can accommodate children at different developmental levels. Emphasizes the integrated approach to curriculum organization, with language arts, music, and arts as central focus. Requires fieldwork.

ED 1407 Elementary Education Curriculum 2**4 QH**

Describes and evaluates social studies curricula in use in elementary school. Develops criteria to select appropriate social studies content, skills, and attitudinal objectives. Expects students to use these criteria to develop social studies experiences that meet the developmental needs of learners and to shed light on the lives of individuals and groups within different cultural settings. *Prereq.* ED 1406.

ED 1408 Elementary School Math**4 QH**

Focuses on methods and materials of mathematics for Early Childhood and Elementary Education majors. Provides the opportunities for University students to explore various strategies and materials of teaching mathematics in a manner that takes into account the developmental stages of children. Requires fieldwork.

ED 1409 Elementary School Science**4 QH**

Surveys methods and materials of science for Early Childhood and Elementary Education majors. Offers the student the opportunity to explore some limited but varied content areas in science and to consider how these areas can be taught to children.

ED 1410 Methods and Materials for Teaching Adolescents and Adults 1**4 QH**

Considers specific methods and materials appropriate to teaching adolescents and adults. Seeks to develop in the students an understanding of the complexities of the materials and methodology of the teaching-learning process, to encourage within students attitudes conducive to and identified with good tenets of teaching, and to foster in the students acceptance of the need to grow constantly and to be aware of the continuing development of the learning-teaching process. Requires fieldwork. *Prereq.* ED 1104.

ED 1411 Methods and Materials for Teaching Adolescents and Adults 2**4 QH**

Focuses on the various subject areas of teaching techniques of organizing and presenting lessons, developing teaching materials, using audiovisual equipment, developing and implementing evaluation instruments, and selecting appropriate materials within the field of interest. Requires fieldwork. *Prereq.* ED 1410.

ED 1412 Fundamentals of Curriculum Development**4 QH**

Examines how goals and objectives are selected and priorities are determined. Analyzes methods for designing educational programs to meet specified goals, methods of evaluating educational outcomes in terms of the goals of the program, and techniques for modifying programs in the light of such performance.

ED 1413 Writing and the Teaching of Writing**4 QH**

Studies the logical and rhetorical bases of exposition and argumentative writing; relationships of assumptions, assertions, and implications; the nature of proof in the sciences, social sciences, and humanities; strategies of argumentation; and the effective consequences of word choice and sentence structure. *Prereq.* ED 1104.

ED 1414 Current Issues in Teaching the Gifted and Talented**4 QH**

Examines issues that affect the type and quality of education available to the gifted and talented in the United States. Describes and evaluates various approaches and programs and reaches conclusions about their effectiveness. Examines research findings on the needs of this segment of the population of learners in order to provide some criteria for future curriculum development.

ED 1415 Teaching Reading to Adolescents and Adults**4 QH**

For secondary education students who are preparing for teaching in the junior or senior high school. Emphasizes language and symbolic process, word recognition, meaning comprehension, and methods and techniques of testing and grouping.

ED 1416 Supervised Field Placement: Early Childhood**2 QH**

Provides a University-arranged institutional placement that allows students to provide educational,

remedial, and/or custodial services to children generally of ages two through five. Provides an opportunity to analyze, develop, demonstrate, and evaluate skills and techniques in guiding the activities of children in nursery schools, day care centers, and/or kindergartens.

ED 1417 Student Teaching and Seminar 8 QH

Allows for full-time participation in a University-arranged and -supervised school program designed to analyze learning and teaching and to demonstrate, evaluate, and develop teaching skills. *Prereq.* Formal acceptance into and completion of advanced professional sequence with minimum 2.0 Q.P.A., both overall and in teaching major.

ED 1800 Directed Study 1 4 QH

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. Preparation consists of approval of the supervising faculty member and the dean's office of the Boston-Bouve College of Human Development Professions. Approval forms must be submitted to the dean's office during the quarter prior to registration for the directed study. *Prereq.* Permission of instructor.

ED 1801 Directed Study 2 4 QH

For students who have completed ED 1800.

INT 1100 Beginning Computer Use 4 QH

Introduces students who are unfamiliar with software applications to computer use through general purpose software: word processing and data processing. Covers operating system commands as well as concepts relating to computer hardware and software. Suggests methods of applying the computer to study requirements in college.

INT 1330 Field Experience in Human Services 1 4 QH

Human services students are required to fulfill two fieldwork placements during the last two years of their program. Each placement consists of 150 hours on site. The type of placement varies according to the student's interest. Field experiences are supervised by University staff to maximize the student's learning opportunity.

INT 1331 Field Experiences in Human Services 2 4 QH

See course description for INT 1330. *Prereq.* INT 1330, junior or senior status, and permission of instructor.

Health, Sport, and Leisure Studies

HSL 1100 Beginning Swimming 1 QH

Focuses on basic swimming skills to non-swimmers, with emphasis on personal water safety.

HSL 1101 Intermediate Swimming 1 QH

Focuses on basic and advanced swimming skills, with emphasis on form and efficiency. *Prereq.* HSL 1100 or equiv.

HSL 1104 Advanced Life Saving 2 QH

Focuses on Red Cross life-saving skills, techniques, and theory; Red Cross certification possible. *Prereq.* HSL 1101 or equiv.

HSL 1105 Water Safety Instructor 2 QH

Focuses on techniques, theory, and instruction methods in swimming and life-saving courses; Red Cross certification possible. *Prereq.* HSL 1101, HSL 1104.

HSL 1106 Beginning Scuba 2 QH

Focuses on basic skin-diving and scuba-diving skills, with emphasis on safety. *Prereq.* HSL 1101 or equiv.

HSL 1107 Sailing 1 QH

Focuses on basic skills in sailing.

HSL 1109 Beginning Gymnastics 1 1 QH

Introduces, in a coeducational approach, basic skills in floor exercise, vaulting, balance beam, parallel bars, uneven bars, high bar, and rings.

HSL 1110 Women's Gymnastics 2 1 QH

Focuses on knowledge and skills necessary to perform the beginning compulsory routines on the balance beam, floor exercise, uneven bars, and vaulting. *Prereq.* HSL 1109.

HSL 1112 Men's Gymnastics 2 1 QH

Focuses on skills and knowledge necessary to perform beginning compulsory routines on the high bar, side horse, rings, floor exercise, parallel bars, and vaulting horse. *Prereq.* HSL 1109.

HSL 1114 Badminton 1 QH

Focuses on basic badminton strokes, concepts, rules, strategies, and game play.

HSL 1116 Tennis 1 QH

Focuses on basic tennis strokes, concepts, rules, strategies, and game play.

HSL 1118 Beginning Archery 1 QH

Focuses on selected skills in target shooting; provides practical experience in archery games, novelty events, and conduct of tournaments.

HSL 1120 Beginning Golf 1 QH

Focuses on fundamental golf skills, knowledge of clubs and their use, and golf etiquette.

HSL 1121 Beginning Self-Defense 1 QH

Surveys the principles and fundamental skills at the beginning and intermediate levels.

HSL 1123 Beginning Wrestling 1 QH

Focuses on basic wrestling maneuvers. Stresses fundamental breakdowns, escapes, takedowns, rides, and pinning combinations. Discusses rules and scoring procedures and modified matches. Lab fee.

HSL 1124 Beginning Fencing 1 QH

Focuses on basic foil fencing; provides introduction to competition.

- HSL 1126 Karate** 1 QH
Focuses on fundamental techniques of unarmed combat for self-defense using the punches, kicks, and blocks of Tae Kwan Do/Karate.
- HSL 1127 Karate 2** 1 QH
Continues HSL 1126, with progression to more complex techniques and combinations of punches, kicks, and blocks related to Tae Kwan Do/Karate. *Prereq.* HSL 1126.
- HSL 1129 Beginning Ice Skating** 1 QH
Focuses on recreational ice-skating skills for beginners.
- HSL 1130 Figure Skating** 1 QH
Focuses on beginning and intermediate figure-skating skills. *Prereq.* HSL 1129 or permission of instructor.
- HSL 1131 Yoga** 1 QH
Introduces yoga skills and techniques for men and women at the beginning level.
- HSL 1132 Weight Training** 1 QH
Introduces the principles and use of resistive exercises: isotonic exercise (weights), isometric exercise, and the appropriateness of each.
- HSL 1133 Physical Conditioning** 1 QH
Focuses on assessing one's personal physical fitness level, with emphasis on establishing a personal exercise regimen based on scientific principles of training. Utilizes special sections for different mediums of exercise, such as aerobic dance techniques, running, and circuit training.
- HSL 1134 Aerobic Exercise and Dance** 1 QH
Focuses on aerobic fitness, with strong emphasis on concepts of exercise safety and conditioning.
- HSL 1135 Yoga 2** 1 QH
Focuses on refinement of poses learned in HSL 1131. Introduces more advanced standing and inverted poses, balances, and back bends. *Prereq.* HSL 1131 or *equiv.*
- HSL 1137 Beginning Cross-Country Skiing** 1 QH
Focuses on the fundamental techniques of cross-country skiing.
- HSL 1138 Beginning Skiing** 1 QH
Focuses on fundamental techniques of downhill skiing. Lab fee.
- HSL 1139 Intermediate Skiing** 1 QH
Focuses on downhill skiing, including intermediate and advanced techniques. Emphasizes skill development. Lab fee. *Prereq.* HSL 1138.
- HSL 1140 Basketball** 1 QH
Focuses on knowledge and skills appropriate for playing basketball at the beginning level.
- HSL 1142 Volleyball** 1 QH
Focuses on knowledge and skills appropriate for playing volleyball at the beginning level.
- HSL 1144 Field Hockey** 1 QH
Focuses on knowledge and skills appropriate for playing field hockey at the beginning level.
- HSL 1146 Softball** 1 QH
Focuses on knowledge and skills appropriate for playing softball at the beginning level.
- HSL 1147 Baseball** 1 QH
Focuses on knowledge and skills appropriate for playing baseball at the intermediate and advanced levels. *Prereq.* HSL 1146 or permission of instructor.
- HSL 1148 Women's Lacrosse** 1 QH
Focuses on knowledge and skill appropriate for playing lacrosse at the beginning level.
- HSL 1149 Men's Lacrosse** 1 QH
Focuses on knowledge and skills appropriate to play lacrosse at the beginning level.
- HSL 1150 Soccer** 1 QH
Focuses on knowledge and skill appropriate to play soccer at the beginning level.
- HSL 1151 Movement Education** 1 QH
Focuses on concepts and techniques in movement education and exploration for elementary school educators.
- HSL 1152 Folk and Square Dance** 1 QH
Introduces folk and square dance.
- HSL 1153 Modern Dance 1** 1 QH
Introduces modern dance technique and style.
- HSL 1154 Modern Dance 2** 1 QH
Continues HSL 1153, with progression to more complex modern dance techniques and combinations. *Prereq.* HSL 1153 or *equiv.*
- HSL 1155 Modern Dance 3** 1 QH
Continues HSL 1154, with progression into the expressive and choreographic use of modern dance techniques. *Prereq.* HSL 1154 or *equiv.*
- HSL 1156 Ballet 1** 1 QH
Introduces ballet fundamentals, with emphasis on alignment.
- HSL 1157 Ballet 2** 1 QH
Continues HSL 1156, with emphasis on developing lyrical style. *Prereq.* HSL 1156 or *equiv.*
- HSL 1158 Ballet 3** 1 QH
Continues techniques introduced in HSL 1157, with emphasis on expanding the repertory of classical ballet movements. *Prereq.* HSL 1165.
- HSL 1159 Jazz Dance 1** 1 QH
Introduces the fundamentals of jazz dance, with emphasis on alignment.
- HSL 1160 Jazz Dance 2** 1 QH
Continues techniques introduced in HSL 1159, with emphasis on developing jazz dance style. *Prereq.* HSL 1159 or *equiv.*
- HSL 1161 Jazz Dance 3** 1 QH
Continues techniques introduced in HSL 1160, with more complex dance techniques and longer combinations. *Prereq.* HSL 1160 or *equiv.*

HSL 1162 Rhythmic Analysis 1 QH

Analyzes rhythm as it applies to movement skills and dance. *Prereq.* *Dance concentration or permission of instructor.*

HSL 1163 Ballroom Dance 1 QH

Introduces traditional and contemporary partner dancing.

HSL 1164 Ballroom Dance 2

Continues HSL 1163 with progression into more complex dance steps, partnering techniques, and amalgamations. Expands upon dances taught in HSL 1163 and introduces additional ballroom dances. *Prereq.* *HSL 1163.*

HSL 1165 Dance Improvisation 1 QH

Provides the opportunity to practice in the use of dance as a medium for artistic expression. Emphasizes the development of skill in the use of improvisational techniques and in structuring choreographic phrases. *Prereq.* *HSL 1153, HSL 1156, or HSL 1159.*

HSL 1167 Beginning Racquetball 1 QH

Focuses on knowledge and skills appropriate to play racquetball at the beginning level.

HSL 1173 Beginning Track and Field 1 QH

Focuses on the fundamental skills in the various track and field events.

HSL 1202 Recreational Sports Leadership 2 QH

Explores teaching techniques involved in team, dual, and individual sports. Presents and investigates methods, such as the part-whole and whole-part, to establish relevance to each of the sports areas under study. Gives students the opportunity to develop skills in planning units and individual lessons. In addition, expects students to apply practical experience by teaching one lesson in each of the sports areas studied.

HSL 1211 Analysis and Coaching of Softball 2 QH

Focuses on the basic techniques and responsibilities of coaching intramural, interscholastic, and intercollegiate softball, including advanced skill analysis and management. *Prereq.* *HSL 1146.*

HSL 1220 Foundation of Leadership in Leisure Service 4 QH

Focuses on leadership at the program level of employment in the broad field of recreation. Provides the opportunity to practice teaching skills both in the classroom and in a required field lab. Examines a variety of topics concerned with the theoretical foundations of leadership in the leisure service professions through required readings and class discussions.

HSL 1221 Introduction to Recreation and Leisure 3 QH

Provides an overview of the recreation park and therapeutic recreation fields, emphasizing history, scope, rationale, setting, programs and services, basic trends and issues, and future considerations. Explores the basic elements of the fields in relation to society, the leisure profession, and the individual.

HSL 1223 Life/Career Planning 4 QH

Helps students develop life/career planning skills for use in pursuit of a career in health, sport, or leisure studies. Explores a variety of careers, co-op job opportunities, and lifestyles of professionals in the field. Gives students the opportunity to assess their own interests, values, needs, and skills and to develop job-finding skills, including resume writing and interviewing techniques.

HSL 1250 Creative Dance 1 2 QH

Focuses on theory and practice of methods and materials in teaching creative dance to elementary school children. Examines children's performance and appropriate teaching techniques with off-campus observation and experience. Partially satisfies prepracticum requirements for teacher certification at K-9 grade level. *Prereq.* *HSL 1154 or HSL 1165.*

HSL 1251 Creative Dance 2 2 QH

Focuses on theory and practice of methods and materials in teaching creative dance to secondary school youth. Examines performance and teaching techniques with off-campus observation and experience. Partially satisfies prepracticum requirements for teacher certification at 5-12 grade level. *Prereq.* *HSL 1154 or HSL 1165.*

HSL 1252 Dance Composition 1 3 QH

Analyzes the use of space, force, and time—the basic elements of the choreographer's craft. Gives students the opportunity to practice and to solve choreographic problems. *Prereq.* *HSL 1154 or permission of instructor.*

HSL 1253 Group Dynamics 1 3 QH

Introduces group dynamics through selected activities, discussion, and living and working together. Includes a resident living experience for one week at the Warren Center as an integral part of the course. Lab fee.

HSL 1254 First Aid 2 QH

Focuses on emergency care procedures recommended for home, school, and community, including cardiopulmonary resuscitation (CPR). Emphasizes practices endorsed by the American Red Cross.

HSL 1255 Human Movement 3 QH

Introduces the nature and role of human movement and analyzes skillful movement performance through participation and observation. Introduces the objectives, literature, and organization of the profession of physical education.

HSL 1257 History and Philosophy of Physical Education 3 QH

Surveys physical education from ancient times to the present. Analyzes the influence of major philosophical positions on physical education programs.

HSL 1258 Elementary School Activities 3 QH

Focuses on introductory knowledge and skills necessary for teaching physical education to children of

elementary school age. Gives students the opportunity to learn about children's performance and appropriate teaching techniques through observation and actual experience in off-campus schools and learning centers. Partially satisfies the prepracticum requirements for teacher certification at the K-9 level.

HSL 1259 Secondary School Activities 3 QH

Studies physical activity appropriate for secondary school students' level of development and interest. Gives students the opportunity to learn about pupils' performance and appropriate teaching techniques through observation and actual experience in off-campus schools and learning centers. Partially satisfies the prepracticum requirements for teacher certification at the grades 5-12 level.

HSL 1260 Perceptual-Motor Development 4 QH

Studies the development of motor skills from birth through infancy, early childhood, adolescence, and adulthood, including skilled performance of the aged. Considers age expectations for perceptual-motor behavior, with a focus on a functional adequacy in skilled performance. *Prereq. ED 1102 and ED 1103; may be taken concurrently.*

HSL 1261 Anatomy and Physiology I 4 QH

Focuses on gross anatomy and physiology of the human skeletal, joint, nervous, and muscular systems.

HSL 1264 Adapted Physical Education I 4 QH

Surveys characteristics and attitudes pertaining to special-needs individuals, with particular emphasis on the effects of their presence on current physical activity programs. Includes observations of special-needs programs. Partially satisfies prepracticum requirements for teacher certification at the grade level K-12. *Prereq. HSL 1261 and HSL 1606.*

HSL 1265 Early Childhood Development 4 QH

Studies the development of fundamental motor patterns (run, catch, kick, strike, jump, throw) from ages 0 to 5 years, including perceptual-motor relations operating in vision, audition, and proprioception.

HSL 1266 Physical Conditioning Programming 2 QH

Focuses on how to design and deliver instruction related to physical conditioning and exercises. *Prereq. HSL 1132 and HSL 1133.*

HSL 1268 Basic Athletic Training Laboratory 1 QH

Discusses the biomechanical and anatomical principles as well as indications and contraindications for application of the various wrapping and strapping techniques involved with athletic injuries. Presents the indications for use and types of protective devices (braces, splints, and so forth). Utilizes lab time for practical application and development of skills. *Prereq. Concurrent with HSL 1605.*

HSL 1272 Dance Composition 2 3 QH

Analyzes the choreographic process, including content, form, technique, and projection. Gives students the chance to solve choreographic problems based on literal and nonliteral themes. *Prereq. HSL 1160.*

HSL 1280 Foundations of Health Education 2 QH

Considers the philosophy of health education, the conceptual approach, and trends in health education. Provides opportunities for students to investigate the broad spectrum of career possibilities in community and school health education.

HSL 1281 Current Issues in Health 4 QH

Explores topics of current interest, which may include emotional health, nutrition, fitness, sexuality, drug use, disease, consumer issues, and environmental issues. Emphasizes the needs of the participants.

HSL 1282 Wellness 4 QH

Explores the concept of wellness, examining behaviors and lifestyle choices that lead to a high level of physical, emotional, and spiritual well-being. Covers assessment of health risk, behavioral change, lifestyle analysis, the life cycle, and stress management through self-analysis.

HSL 1283 Introduction to Safety 2 QH

Introduces the principles and fundamentals of safety education as they relate to people in their environment. Concerns safety as a social problem; considers major accident areas, accident causes, and liability; and analyzes possible solutions to accident problems.

HSL 1284 Instructional Resources 2 QH

Introduces the use of audiovisual media as educational tools. Includes production of slide presentations, transparencies, bulletin boards, and displays. Provides opportunities for experiences in operating selected equipment.

HSL 1285 Health Concerns of Youth 4 QH

Applies health concepts to assist youth in reaching a higher level of wellness through preventive measures. Identifies and deals with significant health concerns as they relate to health professionals, teachers, and adults. Partially satisfies the prepracticum requirements for teacher certification grade levels 5-12.

HSL 1286 Nutrition 4 QH

Offers the student the opportunity to learn and evaluate nutrition information both as a consumer and a future educator. Explains the chemical, biological, and physiological bases of nutrition.

HSL 1300 Swimming Analysis 2 QH

Focuses on theory, analysis techniques, and teaching methods in swimming. *Prereq. HSL 1101 or permission of instructor.*

HSL 1301 Analysis and Coaching of Men's Gymnastics 2 QH

Focuses on skills analysis and coaching of men's gymnastics, with emphasis on teaching methods, new trends, and judging. *Prereq. HSL 1113.*

HSL 1302 Analysis and Coaching of Badminton 2 QH

Focuses on analysis of performance, teaching, and coaching in badminton. *Prereq. HSL 1115.*

HSL 1303 Analysis and Coaching of Tennis 2 QH

Focuses on analysis of performance and methods of teaching in tennis. *Prereq.* HSL 1117.

HSL 1306 Analysis and Coaching of Track/Field 2 QH

Focuses on advanced skills analysis and coaching techniques for selected track and field events. Emphasizes analysis of common movement patterns, teaching methods, and coaching techniques. *Prereq.* HSL 1135 or *equiv.*

HSL 1309 Analysis and Coaching of Basketball 2 QH

Focuses on the basic techniques and responsibilities of coaching interscholastic and intercollegiate basketball, including advanced skills analysis, position and team play, conditioning, practice organization, and team management. *Prereq.* HSL 1140.

HSL 1313 Analysis and Coaching of Soccer 2 QH

Focuses on the basic techniques and responsibilities of coaching intramural, interscholastic, and intercollegiate soccer, including advanced skills analysis, position and team play, conditioning, practice organization, and team management. *Prereq.* HSL 1150.

HSL 1315 Analysis and Coaching of Volleyball 2 QH

Focuses on the basic techniques and responsibilities of coaching intramural, interscholastic, and intercollegiate volleyball, including advanced skills analysis, position and team play, conditioning, practice organization, and team management. *Prereq.* HSL 1142.

HSL 1316 Theory of Officiating 2 QH

Covers the knowledge and skills in the basic concepts of officiating individual and team sports.

HSL 1317 Sports Officiating: Team Sports 2 QH

Focuses on theory, practice, and techniques of officiating in team sports, such as basketball and volleyball.

HSL 1318 Sports Officiating: Individual Sports 2 QH

Focuses on theory, practice, and techniques of officiating individual sports, such as tennis and badminton.

HSL 1319 Analysis and Coaching of Softball 1 QH

Focuses on basic techniques and responsibilities of coaching intramural, interscholastic, and intercollegiate softball, including advanced skills analysis and management. *Prereq.* HSL 1146.

HSL 1320 Analysis and Coaching of Gymnastics 2 QH

Focuses on skills analysis and coaching of women's gymnastics, with emphasis on appropriate teaching methods and new trends. *Prereq.* HSL 1111.

HSL 1321 Modern Dance 4 1 QH

Continues techniques introduced in HSL 1155 with emphasis on the application of modern dance technique and style in the performance of modern dance repertory. *Prereq.* HSL 1155 or *equiv.*

HSL 1322 Ballet 4 1 QH

Continues techniques introduced in HSL 1158 with in-depth study of the complicated variations derived from classical ballet. Emphasizes line and expressive interpretation. *Prereq.* HSL 1158 or *equiv.*

HSL 1324 Jazz Dance 4 1 QH

Continues techniques introduced in HSL 1161 with emphasis on style and expressive interpretation. Progresses into the choreographic use of jazz dance. *Prereq.* HSL 1161 or *equiv.*

HSL 1325, HSL 1326, HSL 1327 Dance Rehearsal and Performance 1, 2, 3 1 QH each

Gives students the opportunity to develop skill in performance. Also allows students to choreograph, stage, and perform an original work or perform in the original work of a guest or faculty choreographer. *Prereq.* *Permission of instructor.*

HSL 1400 Organizational Behavior 3 QH

Studies human behavior in groups through lectures, reading, and projects. Concentrates on management skills and employment legislation.

HSL 1401 Program Planning in Recreation 4 QH

Examines in-depth the steps in planning recreation programs in concert with practical experience.

HSL 1402 Leisure and Lifestyles 4 QH

Focuses on aspects contributing to lifestyles and the role of leisure. Examines specific lifestyles through readings and video-taped movies. Gives students the opportunity to examine the effect of leisure on their lifestyles and future aspirations.

HSL 1403 Concepts of Leisure: Sociopsychological Perspectives 4 QH

Explores the various sociopsychological perspectives of leisure and the relations of mores, social structure, roles, values, and personality to leisure expression. Investigates other pertinent social and environmental factors that contribute to the phenomenon of leisure.

HSL 1406 Internship Seminar 1 QH

Offers preparation for professional field assignment in a leisure-service setting. Focuses on identification and assessment of student career goals, analysis of previous volunteer and/or employment experience, professional involvement, and facilitation of the internship placement process.

HSL 1408 Research Methods 4 QH

Studies basic statistics, the use of experimental and quasi-experimental design, sampling, instrumentation, data collection, and analysis as applied in recreation and leisure studies.

HSL 1409 Research Applications 4 QH

Examines the use of research methods in selected professional applications ranging from the ongoing research of faculty to student-originated studies.

HSL 1410 Senior Seminar in Contemporary Issues and Trends in Recreation and Leisure 4 QH

Examines and discusses contemporary issues and trends in the field of recreation and leisure. Focuses on critical aspects of leisure services: legislation, consumer advocacy, professional development, research, and innovations for the improvement of service delivery.

HSL 1421 Management of Recreation and Physical Education Programs 4 QH

Focuses on management procedures of recreation and physical education facilities operations. Emphasizes area and facility design, personnel policies, and problem solving related to administration and management.

HSL 1422 Program Evaluation in Recreation 4 QH

Examines comprehensive systems for evaluating program effectiveness as it relates to the consumer of recreation services. Emphasizes developing an evaluation system for an agency of the student's choice. Draws case studies from the public, non-profit, and commercial sectors.

HSL 1423 Commercial Recreation Marketing 4 QH

Examines commercial and private sector recreation services. Relates case studies, workshops, and practical problems to managing leisure opportunities for resorts, country clubs, theme parks, tourism, sports clubs, manufacturing and merchandising, and industrial recreation.

HSL 1426 Budget Analysis 4 QH

Focuses on the study and use of analytical techniques that can improve budgeting decisions. Considers cost-effectiveness and benefit-cost analysis, efficiency measures, and pricing for solutions to capital and operating-budget problems in the non-profit and commercial recreation sectors.

HSL 1427 Survey of Recreation Facilities 3 QH

Studies fundamental management, administration, and construction concepts for a wide variety of facilities such as parks, centers, arenas, camps, and marinas.

HSL 1446 Elements of Outdoor Recreation Planning 4 QH

Explores the nature and significance of the outdoor recreation experience and how our natural resources can optimally meet people's needs. Focuses on the elements of outdoor recreation planning; identification, evaluation, assessment, and implementation. Includes relation of social groups, natural resources, and environmental concerns to outdoor recreation planning.

HSL 1460 Process of Aging 3 QH

Focuses on aging and public policy in the United States. Uses the Older American Act and related legislation to examine how the partnership among federal, state, and local agencies operate to deliver services to older people. Studies leisure needs and services in the context of congregate living, life-care communities, senior centers, and adult day health care.

HSL 1461 Camping and Outdoor Education for the Handicapped 3 QH

Focuses on innovations in outdoor learning with an emphasis on wellness, the American Indian, outdoor adventure activities, and a holistic perspective on the individual with a disability. Includes observations and practical applications.

HSL 1462 Leisure Counseling 4 QH

Provides students an opportunity to develop fundamental group counseling skills through the use of specialized strategies and traditional verbal counseling techniques. Focuses on lifestyle awareness counseling.

HSL 1463 Overview of Physical Disabilities 4 QH

Offers a holistic and humanistic approach to people with physical disabilities, including amputations, traumatic conditions, sensory impairments, and neurological, orthopedic, and cardiovascular disorders. Studies rehabilitation procedures and treatment, adjunctive therapies, prosthetics, orthotics, assistive devices, and personal care techniques.

HSL 1464 Program Planning in Therapeutic Recreation 4 QH

Examines advanced planning of comprehensive therapeutic recreation services. Focuses on systems approach to planning for individuals and groups. Includes an intensive examination of the philosophy of therapeutic recreation; the study of the functional elements of activities, current legislation, and standards for service delivery.

HSL 1465 Therapeutic Recreation with Developmentally Disabled Persons 4 QH

Reviews major phases of normal growth and development for the purpose of understanding the causes and impact of developmental disabilities. Emphasizes role of play experiences in achieving sequentialized skills and concepts, practices, and procedures employed in program design.

HSL 1466 Foundations of Psychiatric Services in Therapeutic Recreation 4 QH

Focuses on orientation to the foundations of mental health and variables affecting mental illness. Examines various psychiatric disorders and treatment modalities and the role of activity therapy in the treatment of mental illness. Reviews contemporary trends in psychiatry that pertain to therapeutic recreation. *Prereq.* *Permission of the instructor.*

HSL 1467 Social and Psychological Impacts of Illness and Disabilities 4 QH

Explores relevant issues related to disability such as societal attitudes; self-concept, coping, family, grieving, and life restructuring through a mixture of lectures, group discussion, guest speakers, and films. Examines self in the role of change agents and care providers. *Prereq.* *HSL 1463.*

HSL 1500 Mental Health 4 QH

Investigates emotional health and well-being as they relate to total health, with emphasis on factors that influence emotional behavior. Includes various approaches to emotional health in school programs and the community.

HSL 1502 Communicable and Degenerative Diseases 4 QH

Focuses on the disease immunity process, with emphasis on prevalent communicable diseases in the

United States today and their transmission. Also studies chronic diseases, cardiovascular diseases, cancer, diabetes, and other constitutional and degenerative diseases and disorders that affect the nation's health.

HSL 1503 Human Sexuality and Family Dynamics 4 QH

Examines sexuality from a physical, psychological, social, historical, and cultural perspective; needs and concerns about sexuality at various stages in life, including a variety of approaches to sex education in schools, community, and the family.

HSL 1504 Longevity and Aging 4 QH

Studies the biological, psychological, and sociological aspects of human aging. Considers the importance of one's current lifestyle in relation to the phenomenon of longevity and the quality of life.

HSL 1506 Evolving Patterns of Community Health Education 4 QH

Analyzes principles of community health, with emphasis on contemporary local, national, and international organizations for meeting health problems. Considers health care delivery, consumer health issues, environmental health, community resources, and the role of health education in the community.

HSL 1507 Seminar 1 2 QH

Introduces research and scientific writing, culminating in a research project in an area of special interest. *Prereq.* ED 1306.

HSL 1508 Seminar 2 2 QH

Discusses current problems and new developments as they relate to health education in school and in a variety of community settings. *Prereq.* HSL 1507.

HSL 1509 Organization and Administration of Health Education Programs 4 QH

Examines principles and methods of organization and administration of school and community health education programs. Covers ethics, personnel, budget, facility management, and priorities.

HSL 1510 Health Counseling 4 QH

Identifies physical, mental, emotional, and social health problems; remedial procedures; and counseling techniques to aid health educators in dealing more effectively with various health problems. *Prereq.* Juniors and seniors only.

HSL 1511 Independent Study 1 1 QH

HSL 1512 Independent Study 2 2 QH

HSL 1513 Independent Study 3 3 QH

HSL 1514 Independent Study 4 4 QH

Provides the student with an opportunity for concentrated planning and research in a topic area of health, sport, or leisure. Requires student to submit outline of proposed study.

HSL 1515 Public Health Administration 4 QH

Presents history and overview of public health agencies and the organization of services for meeting public health needs at the local, state, federal, and international levels. Focuses on today's major health problems and services.

HSL 1516 Drug Use and Abuse 4 QH

Explores the use and abuse of drugs in our society, including prescription and OTC drugs, alcohol, and tobacco. Examines physiological, psychological, and sociological effects of drugs on humans.

HSL 1517 Death, Bereavement, and Suicide 4 QH

Presents an interdisciplinary approach to the contemporary issues involved in death and bereavement. Examines death from a lifecycle approach, including the dynamics of grief and mourning. Discusses suicide as it relates to self-concept and stress.

HSL 1518 Assessment of Community Health 4 QH

Focuses on today's major community health problems, with an overview of the methods of assessment and evaluation of health needs at the local, state, federal, and international levels.

HSL 1585 Teaching Procedures in Health Education in School and Community 4 QH

Introduces the prospective health educator to health education curriculum, techniques of planning, and pertinent methods and materials in school and community health education. Partially satisfies the pre-practicum requirements for teacher certification at grade levels 5–12. *Prereq.* ED 1104 and HSL 1285.

HSL 1600 Psychology of Sport 2 QH

Analyzes the psychological behavioral patterns and deviations of sports participants, including spectators and coaches. Emphasizes emotions, motivation, competition, and learning factors. Discusses current sports highlights. *Prereq.* Physical education major or permission of instructor.

HSL 1601 Sociology of Sport and Dance 2 QH

Studies sport and dance as social institutions, including theories explaining the role of each in contemporary society and the part of each in evolving societies. *Prereq.* Permission of instructor.

HSL 1602 Theory of Coaching 2 QH

Analyzes learning principles, sociology, and psychology as applied to coaching individual, dual, and team sports. Presents techniques and standards of squad recruitment, organization, leadership, and coaching ethics.

HSL 1603 Theory of Play 2 QH

Examines the nature of play and cross-cultural patterns of play. Investigates selected theories of play, including Huizinga, Caillois, Sutton-Smith, and Lee.

HSL 1604 Group Dynamics 2 2 QH

Exposes students to outdoor activities typical of outdoor adventure programs and to practices and philosophies of Project Adventure, Outward Bound, and national outdoor leadership schools. Emphasizes skills teaching. Requires resident experience. Lab fee. *Prereq.* HSL 1253.

HSL 1605 Basic Athletic Training 3 QH

Focuses on the training and conditioning procedures in athletic programs. Emphasizes the prevention of athletic injuries. Examines roles of the trainer, athlete, coach, and health service.

HSL 1606 Perceptual-Motor Learning 4 QH
Focuses on how information processing is involved in perceptual-motor learning and performance. Applies basic research data to learning and executing skills in a variety of sports settings. *Prereq.* PSY 1111 or *equiv.*

HSL 1607 Measurement and Evaluation 4 QH
Discusses construction, use, selection, and interpretation of evaluative tools applicable to health, sport, and leisure studies. Examines elementary statistical methods. *Prereq.* ED 1307.

HSL 1608 Clinical Athletic Training 2 QH
Introduces the student athletic trainer to clinical experience with an opportunity to practice the various skills for evaluation and treatment of the injured athlete. *Prereq.* HSL 1605.

HSL 1609 Advanced Athletic Training 4 QH
Presents the advanced preparation and utilization of conditioning programs and their administration for prevention and care of injuries associated with competitive athletics. *Prereq.* HSL 1605.

HSL 1610 Anatomy and Physiology 2 4 QH
Examines gross anatomy and physiology of the human cardiovascular, respiratory, digestive, urinary, and endocrine systems. Also covers metabolism, calorimetry, and other applied topics. *Prereq.* HSL 1261.

HSL 1611 Kinesiology 4 QH
Investigates science of human motion and anatomic and mechanical principles as they relate to an understanding of skillful, efficient, and purposeful human motion. Examines the internal and external forces acting on a human body and their effects. *Prereq.* HSL 1261.

HSL 1612 Physiology of Exercise 4 QH
Studies the immediate and long-range effects of exercise on the human body, with emphasis on the cardiovascular and respiratory systems, muscles, and metabolism; physical fitness, body composition, and selected components of motor performance—assessment techniques and training principles. Introduces indirect open-circuit calorimetry and EKG monitoring. *Prereq.* HSL 1610.

HSL 1613 Laboratory in Exercise Testing and Prescription 4 QH
Presents a practicum in assessment of functional cardiovascular, muscular strength, muscular endurance, flexibility, and body composition. Gives students the opportunity to prescribe exercise programs used to improve functions through volunteer work as an exercise test technician and exercise leader in a fitness class. *Prereq.* HSL 1612.

HSL 1614 Electrocardiography 4 QH
Studies basic and intermediate electrocardiography, including cardiac function, lead systems, rate, rhythm, axis, infarction, ischemia, hypertrophy, effects of cardiovascular drugs, and effects of exercise. *Prereq.* HSL 1612.

HSL 1615 Critical Teaching Skills 4 QH
Analyzes direct and indirect, verbal and nonverbal teaching methods for classroom and activity teaching, using techniques such as microteaching, peer teaching, and simulation. Examines techniques for measuring teacher behavior, such as interaction analysis. Requires a lab experience in an education setting. Partially satisfies prepracticum requirements for teacher certification. *Prereq.* HSL 1258 or HSL 1259; *prepracticum experience.*

HSL 1616 Curriculum Development 3 QH
Focuses on basic foundations of curriculum development. Stresses fundamental principles and guides to curriculum organization, format, and evaluation. Includes experience using the taxonomies of education objectives and survey of existing curricula and current curriculum trends.

HSL 1618 Exercise and Activities for the Older Adult 4 QH
Studies principles of physical activity and the organization of physical activity programs for the elderly in public and private agencies. Requires research and practical applications of theory.

HSL 1621 Dance in Cultural Perspective 4 QH
Surveys dance from ancient times to 1900 with the focus on the evolution of dance as a theater art.

HSL 1625 Senior Seminar 4 QH
Provides an opportunity for senior students to discuss pertinent new topics and concepts in sports medicine. *Prereq.* *Permission of instructor.*

HSL 1626 Therapeutic Reconditioning for Athletic Training 4 QH
Covers principles and objectives inherent in the rehabilitation process of athletic injuries. Discusses basic rehabilitation fundamentals, as well as specific conditioning and reconditioning techniques. Exposes the student to the different types of exercise, as well as the different rehabilitative equipment used in a rehabilitation program. Provides laboratory experiences in the application of exercise programs and use of equipment. *Prereq.* HSL 1627.

HSL 1627 Therapeutic Modalities for Athletic Training 4 QH
Presents physical agents used in athletic training with regard to their physiological effects, where in the healing process they may be used, and all indications and contraindications for use. Utilizes laboratory experiences in application of those physical agents. *Prereq.* HSL 1605.

HSL 1630 Aspects of Dance 3 QH
Introduces dance forms, functions, and styles. Analyzes dance as an art and surveys dance professions. Includes lectures, lab, and attendance at performances.

HSL 1632 Dance in the Twentieth Century 4 QH
Surveys dance in the twentieth century. Focuses on the emergence and development of modern dance and the impact of twentieth-century choreographers on the classical ballet tradition. Uses slides and films

to illustrate the choreographic innovations of artists such as Graham, Nikolais, Sharp, Fokine, Balanchine, and Bejart. *Prereq.* HSL 1621.

HSL 1634 Laban Movement Analysis 2 QH
Introduces Laban's qualitative system of movement description and behavior. Emphasizes the study of effort, shape, and space harmony.

HSL 1777 Honors Adjunct 1 QH
To be added to any four-credit course in the department when approved by the Honors Committee of Boston-Bouvé. Once approved, the adjunct information is forwarded to the honors office for dissemination to the honors membership. Allows enrollment an unlimited number of times as an adjunct to any health, sport, and leisure studies course at different times during a given academic year.

HSL 1800 Supervised Field Experience 1 6 QH
When combined with another approved field-based course (HSL 1801 or HSL 1803), offers assignment in a field setting related to the student's area of study within the curriculum, including observing and performing professional skills under the guidance of a certified cooperating field professional and college supervisor. Includes supervision, evaluation conferences, and seminars as an integral part of this experience. Taken by HSL majors not in teacher preparation.

HSL 1801 Supervised Field Experience 2 6 QH
When combined with another approved field-based course (HSL 1800 or HSL 1802), offers assignment in a field setting related to the student's area of study within the curriculum, including observing and performing professional skills under the guidance of a certified cooperating field professional and college supervisor. Includes supervision, evaluation conferences, and seminars as an integral part of this experience.

HSL 1802 Supervised Student Teaching 1 6 QH
Provides a supervised teaching experience in an approved school in which the student assumes clear instructional responsibilities for at least half of the time and full teaching responsibilities for a substantial period of time under the guidance of a certified cooperating teacher and college supervisor. Must be at the level of the teacher certification sought.

Includes supervision, evaluation conferences, and seminars as an integral part of this experience. Taken by students who wish to apply for teacher certification. Allows a minimum of 300 clock hours for teacher certification to be achieved when the student successfully completes this course and HSL 1801 or HSL 1803. These courses should be taken in the same quarter.

HSL 1803 Supervised Student Teaching 2 6 QH
Provides a supervised teaching experience in an approved school in which the student assumes clear instructional responsibilities for at least half of the time and full teaching responsibilities for a substantial period of time under the guidance of a certified cooperating teacher and college supervisor. Must be at the level of the teacher certification sought. Includes supervision, evaluation conferences, and seminars as an integral part of this experience. Taken by students who wish to apply for teacher certification. Allows a minimum of 300 clock hours for teacher certification to be achieved when the student successfully completes this course and HSL 1801 or HSL 1802. These courses should be taken in the same quarter.

HSL 1805 Supervised Student Teaching 3 6 QH
Extends HSL 1802 and HSL 1803 to accommodate students pursuing certification at two levels and who require the additional student teaching practicum of an additional 150 hours. May also be used by student teachers needing extra involvement to meet certification standards not met during HSL 1802 and HSL 1803.

HSL 1863 TAC—Special Problems 2 QH
Presents directed study in analysis and coaching of a sport or activity not offered by the department or in special scheduling situations, for example, field hockey, football, lacrosse, wrestling. *Prereq.* *Permission of instructor.*

HSL 1866 Special Problems 4 QH
Focuses on independent, faculty-supervised investigation in an area of each student's interests. Culminates in a formal written report. Teacher certification requirements available in 3 Dockser Hall. *Prereq.* *Permission of instructor.*

Physical Therapy

PTH 1114 Introduction to Physical Therapy 1 2 QH

Provides orientation to the field of physical therapy and its role in the health professions. Explores theory and practice in applied body mechanics and basic procedures related to patient management.

PTH 1115 Introduction to Physical Therapy 2 2 QH

Provides practice in the preparation of patients and equipment for various treatment procedures.

Focuses on theory demonstration and practice in heat, light, and hydrotherapy.

PTH 1118 Development Base of Human Performance 4 QH

Studies the growth and development of perceptual-motor skills from birth to old age. Considers age expectations for perceptual-motor behavior, focusing on the processes underlying developmental changes.

PTH 1310 Clinical Gross Anatomy 6 QH

Regionally covers the structure and function of the human body, with particular emphasis on the skeletal, muscular, nervous, and vascular components of each region. Involves lectures, cadaver prosection, osteology labs, and surface anatomy palpation to investigate basic human anatomy and the clinical applications of anatomy lab. *Prereq.* BIO 1254 and BIO 1255.

PTH 1315 Physiology for Physical Therapists 5 QH

Covers neuromuscular, cardiovascular, and respiratory physiology applied to physical therapy. *Prereq.* BIO 1254, BIO 1255, and PTH 1115.

PTH 1320 Physical Therapy 1 2 QH

Offers theory, demonstrations, and practice of manual therapy integrated with other treatment procedures. Also covers anatomical and physiological theory and principles. Uses problem solving and case analyses. *Prereq.* BIO 1254, BIO 1255, and PTH 1115.

PTH 1325 Clinical Medicine 1 4 QH

Covers general medicine, lab medicine, and pathology as related to conditions commonly treated by physical therapists. *Prereq.* BIO 1254 and BIO 1255.

PTH 1330 Clinical Kinesiology 5 QH

Studies normal movement through analysis of muscle and joint function. Also gives clinical applications for pathological movement. Includes lab. *Prereq.* PTH 1310 and PTH 1315.

PTH 1335 Physical Therapy 2 3 QH

Covers evaluation procedures, including theory, demonstration, practice, and planning. *Prereq.* PTH 1310, PTH 1315, and PTH 1320.

PTH 1340 Physical Therapy 3 4 QH

Covers basic therapeutic exercise, including theory, demonstration practice, and planning. *Prereq.* PTH 1114, PTH 1115, PTH 1310, PTH 1315, PTH 1320.

PTH 1345 Clinical Medicine 2 3 QH

Focuses on orthopedic conditions and their medical, surgical, and physical therapy treatment. *Prereq.* PTH 1310, PTH 1315, and PTH 1325.

PTH 1352 Psychosocial Aspects of Illness 3 QH

Examines interpersonal relationships among patients, families, health professionals, and society, with reference to the impact of and reaction to illness. *Prereq.* Satisfactory attainment in all prior professional courses.

PTH 1355 Physical Therapy 4 3 QH

Covers theory, demonstration, and practice in prosthetics, orthotics, and advanced functional training of spinal cord-injured patients. *Prereq.* PTH 1315, PTH 1330, PTH 1335, PTH 1340, and PTH 1345.

PTH 1360 Physical Therapy 5 4 QH

Presents theoretical basis and clinical application of integrated approaches to treatment of neurologically impaired clients. *Prereq.* Satisfactory attainment in all prior professional courses.

PTH 1366 Neuroanatomy 5 QH

Examines morphology and function of the human nervous system. Covers abnormalities of structure and function of the nervous system. Includes lecture and lab. *Prereq.* PTH 1340.

PTH 1370 Clinical Seminar 2 QH

Discusses selected topics related to clinical aspects in physical therapy. Considers interpersonal relationships, ethics, teaching-learning process, communication, group dynamics, medical-legal issues, sociocultural/socioeconomic considerations, and clinical education information. *Prereq.* Satisfactory attainment in all prior professional courses.

PTH 1375 Physical Therapy 7 2 QH

Covers theory, demonstration, and practice in electrical testing and treatment procedures. *Prereq.* PTH 1335, PTH 1345, and PTH 1366.

PTH 1380 Supervised Clinical Education 1 5 QH

Introduces clinical experience that provides the student with opportunities to practice various skills in the evaluation and treatment of patients under supervision. Requires five weeks during Quarter 9 of the junior year in Massachusetts. *Prereq.* Satisfactory attainment in all prior professional courses.

PTH 1385 Clinical Medicine 3 3 QH

Focuses on the pediatric and neurologic aspects of physical therapy practice, including review of symptoms, conditions, and therapeutic intervention. *Prereq.* Satisfactory attainment in all prior professional courses.

PTH 1390 Physical Therapy 6 3 QH

Covers respiratory physical therapy, including theory, demonstration, and practice in the management of medical and surgical chest conditions. Introduces respiratory mechanical equipment and cardiopulmonary resuscitation. *Prereq.* PTH 1315, PTH 1330, PTH 1335, and PTH 1340.

PTH 1395 Physical Therapy 5 (PTH 1360 continued) 1 QH

Covers neurodevelopmental treatment, neurophysiological theory, and clinical application of facilitation and inhibition techniques to enhance motor control. *Prereq.* PTH 1330, PTH 1335, PTH 1340, PTH 1345, PTH 1360, and PTH 1366.

PTH 1400 Administration 4 QH

Explores concepts in administration and management applied to physical therapy. Involves seminar and discussion groups. *Prereq.* PTH 1380.

PTH 1405 Research for Physical Therapy 4 QH

Covers introduction to research design, basic statistics, analysis of scientific and medical literature, and preparation of an independent research proposal. *Prereq.* Satisfactory attainment in all prior professional courses.

PTH 1411 Physical Therapy 8 4 QH

Incorporates analysis and comparison of methods of physical therapy evaluation and treatment, with an emphasis on therapeutic exercise. Focuses on treatment planning for various problems, with emphasis

on rationale and selection of treatment alternatives. Uses case study format and case simulations. Meets for three lecture hours, with the third hour in seminar format with small-group discussions. *Prereq.* *Satisfactory attainment in all prior professional courses.*

PTH 1415 Supervised Clinical Education 2 0 QH

Provides advanced clinical education by giving the student further opportunities to practice various phases of physical therapy under supervision in preparation for assuming the role of a qualified physical therapist. Involves assignments in Massachusetts and other states, and twelve weeks during senior year. Required for graduation from the physical therapy program. *Prereq.* *Satisfactory attainment in all prior professional courses.*

PTH 1420 Physical Therapy in the Health Care System 3 QH

Examines major issues affecting the delivery of health care. Emphasizes the role of the physical therapist as a member of the health team. Involves class discussion and seminar. *Prereq.* *PTH 1370 and PTH 1380.*

PTH 1426 Functional Assessment of the Elderly Client 3 QH

Discusses the interaction of psychological, social and physiological factors and their effects on the potential for function of the elderly client. Studies and designs assessment instruments. *Prereq.* *PTH 1370 and PTH 1380.*

PTH 1450 Investigative Studies 6 QH

Covers selected modules related to current practice in physical therapy; completion of research project on a volitional basis. *Prereq.* *Satisfactory attainment in all prior professional courses.*

PTH 1702 Special Topics in Physical Therapy 2 QH

Offers innovative methods of instruction and deals with areas of special interest.

PTH 1704 Special Topics in Physical Therapy 4 QH

Offers innovative methods of instruction and deals with areas of special interest.

PTH 1777 Honors Adjunct 1 QH

Constitutes an addition to any three, four-, five-, or six-quarter-hour course in the department when approved by the honors committee of Boston-Bouvé. Once approved, the adjunct information is forwarded to the honors membership by the honors office. Allows students to enroll an unlimited number of times as an adjunct to any physical therapy course.

PTH 1800 Directed Study 2 QH

Provides experience for the student whose unique academic needs or interests cannot be adequately satisfied in the basic, entry-level curriculum of the Department of Physical Therapy. *Prereq.* *Permission of instructor, chair, and dean.*

Speech-Language Pathology and Audiology

SLA 1101 Introduction to Speech and Hearing 4 QH

Offers an overview of disorders of speech and hearing and their treatment, and a review of normal speech and hearing development. Requires clinical observations of persons with speech, language, and hearing disorders.

SLA 1200 Hearing Science 4 QH

Presents basic concepts related to the physics of sound, followed by an in-depth study of the anatomy and physiology of the normal hearing mechanism. In addition, discusses basic principles of psychophysics of audition. *Prereq.* *SLA 1101.*

SLA 1201 Anatomy and Physiology of Vocal Mechanisms 4 QH

Offers an in-depth study of the static structure, musculature, and physiology of the speech mechanism. Emphasizes current research in speech physiology. *Prereq.* *SLA 1101.*

SLA 1300 Developmental Semantics and Syntax 4 QH

Analyzes the emerging semantic and syntactical aspects of language in normal and atypical children. Discusses current theory and research in language acquisition. Requires clinical observations of children with normal and atypical language patterns. *Prereq.* *SLA 1101.*

SLA 1301 Phonetics and Developmental Phonology 4 QH

Offers basic training in auditory recognition and symbolization of phonemes and allophones in major American dialects. Stresses static and dynamic articulatory descriptions. Also includes a review of the developmental sequence of phonemic acquisition. *Prereq.* *SLA 1101 and SLA 1201.*

SLA 1302 Phonemic Disorders 4 QH

Provides a practical and theoretical examination of the phonemic disorders and their etiology; also examines diagnostic tools for evaluation and methods of treatment. Requires clinical observations of persons with phonemic disorders. *Prereq.* *SLA 1201, SLA 1300, and SLA 1301.*

SLA 1303 Introduction to Audiology 4 QH

Focuses on the basic techniques of audiometric testing and hearing conservation, including a review of basic hearing sciences and a prepracticum and laboratory experience in hearing testing. *Prereq.* *SLA 1200.*

SLA 1400 Speech Science 4 QH

Examines the basic sciences involved in speech and audition, including in-depth study of the analysis of sound and the acoustic composition of speech.

Emphasizes a review of current theory and research in speech reception, perception, and production. *Prereq.* SLA 1101 and SLA 1200.

SLA 1401 Fluency Disorders 4 QH
Offers a comprehensive study of the various theories and symptomatology of stuttering from the earliest historical references through the nineteenth and twentieth centuries. Requires clinical observations. *Prereq.* SLA 1201.

SLA 1800 Directed Study 4 QH
Provides study for the student whose unique academic needs or interests cannot adequately be

satisfied in any of the scheduled courses of the department. Requires approval of the supervising faculty member, the chairperson, and the Office of the Dean of the Boston-Bouvé College of Human Development Professions. Also requires that approval forms be submitted to the dean's office during the quarter prior to registration for the directed study. *Prereq.* *Permission of instructor.*

Pharmacy

PAH 1135 Professional Dynamics in the Health Care Delivery System 4 QH
Examines the evolution of the American health care delivery system, with emphasis on current aspects of how health care is delivered, how it is financed, where it is delivered, and who delivers it. Discusses present and future influences in health, including health promotion, disease prevention, and environmental issues. Considers unique and collective health professional roles and responsibilities, humanistic/behavioral dimensions of health care, professional organizations, and professionalism.

PAH 1202 Anatomy-Physiology I 5 QH
Covers structure and function of cells, tissues, and organs, including the muscular, immune, and nervous systems. Includes human skeletal anatomy and cat dissection. Oriented to students in the health professions. Lab fee. *Prereq.* CHM 1122 or CHM 1102 and BIO 1107.

PAH 1204 Anatomy-Physiology 2 5 QH
Covers structure and function of the various life-supportive systems not covered in the first quarter: cardiovascular, endocrine, gastrointestinal, and pulmonary systems. Emphasizes in the lab the basic principles involved in understanding the functioning life systems and cell function. Lab fee. *Prereq.* PAH 1202 or permission of instructor.

PAH 1210 Anatomy-Physiology I 4 QH
Offers students the opportunity to take the lecture portion only of PAH 1202. *Prereq.* *Permission of instructor.*

PAH 1211 Anatomy-Physiology Laboratory I 1 QH
Offers students the opportunity to take the lab portion only of PAH 1202. *Prereq.* *Permission of instructor.*

PAH 1212 Anatomy-Physiology 2 4 QH
Offers students the opportunity to take the lecture portion only of PAH 1204. *Prereq.* *Permission of instructor.*

PAH 1213 Anatomy-Physiology Laboratory 2 1 QH
Offers students the opportunity to take the lab portion only of PAH 1204. *Prereq.* *Permission of instructor.*

PAH 1280 Biochemistry 5 QH
Introduces the structures, functions, and metabolism of amino acids, proteins, carbohydrates, lipids, and nucleic acids. Discusses the mechanisms of enzyme reactions, enzyme kinetics, vitamins, biological oxidation reduction reactions, and bioenergetics, as well as various inborn errors of metabolism.

PAH 1776 Junior/Senior Honors Thesis 4 QH
Provides students with the opportunity to become involved with faculty on either ongoing research projects or student-initiated scholarly activities. Encourages and assists students in writing, presenting, and publishing their research. Allows students to gain an awareness and some understanding of a discipline or area of study in the allied health professions while developing an appreciation for research methods and the process of scientific inquiry. Requires submission of a junior/senior thesis. *Prereq.* *Honors participation.*

PAH 1777 Honors Directed Study 1 QH
Designed to be attached to a predesignated professional course in the student's major and offered at the discretion of the faculty member(s) teaching the course. For further details, contact the honors office (215LA) or PAH honors advisor. *Prereq.* *Honors participation, permission of instructor.*

PCL 1101 Drugs—Their Uses and Actions 4 QH
Studies background, classification, dose responses, untoward side effects, uses, and commercial preparations of a broad series of drugs. *Not open to pharmacy, respiratory therapy, or nursing majors.*

PCL 1301 Basic Pharmacology 3 QH
Provides students an opportunity to learn the classification, mechanisms of action, and uses of a broad spectrum of therapeutic agents. Emphasizes dose response and untoward side effects. *Prereq.* *Permission of instructor.*

PCL 1305 Pharmacodynamics 3 QH
Introduces pharmacologic principles, with the pharmacotherapeutics of drug groups and individual drug substances of particular importance in treatment and diagnosis of disease. *Prereq.* BIO 1120, BIO 1255, CHM 1111, and CHM 1112.

PCL 1309 Pharmacology for the Respiratory-Care Practitioner 4 QH

Provides an orientation to pharmacology, including the scope of pharmacology; definitions; drug standards; drug legislation; names, sources, and active constituents; and pharmaceutical preparations of drugs relating to the respiratory-care practitioner.

PCL 1410 Introduction to Pathology 4 QH

Focuses on basic concepts of pathology for the pharmacy, toxicology, and respiratory therapy majors, with emphasis on disease processes and alterations of normal biochemical mechanisms. *Prereq.* PAH 1202 and PAH 1204.

PCL 1419 Pharmacology/Medicinal Chemistry 1 5 QH

Introduces the principles of pharmacology and medicinal chemistry. Discusses major drug classes affecting the central nervous system, including anxiolytics, sedative-hypnotics, anesthetics, anticonvulsants, neuroleptics, antidepressants, and narcotic analgesics. Considers therapeutic indications, mechanisms of action, structure-activity relations, and undesirable actions including the problems of drug abuse. *Prereq.* BIO 1107, CHM 1265, PAH 1202, and PAH 1204.

PCL 1420 Pharmacology/Medicinal Chemistry 2 6 QH

Continues discussion of topics introduced in PMC 1419. Presents an interdisciplinary chemical and pharmacological approach to understanding drug action. Deals principally with drugs affecting the peripheral nervous, cardiovascular, and renal systems. *Prereq.* PMC 1419.

PCL 1422 Pharmacology/Medicinal Chemistry 3 6 QH

Continues discussion of topics in PCL 1420. Covers the medicinal chemistry and pharmacology of drugs acting on the gastrointestinal, endocrine, reproductive, and hematopoietic systems, along with autocoid and antineoplastics. *Prereq.* PCL 1420.

PCL 1451 Pharmacology Laboratory 1 QH

Provides experience in systematically monitoring the qualitative effects of selected drugs from major classes of drugs by a modified "Hippocratic Screen" technique. Studies basic quantitative characteristics of drug dose-response relationships, factors influencing such relationships, and general methods of calculating and reporting such data. Lab fee. *Prereq.* PMC 1418.

PCL 1801, PCL 1802, PCL 1803 Special Research Project (Pharmacology) 4 QH each

Provides opportunity for directed study or research in pharmacology/toxicology wherein the student may undertake in-depth investigation of an area of specialized interest. Lab fee. *Prereq.* Permission of instructor and program director.

PCT 1230 Pharmaceutical Calculations 3 QH

Introduces the general scope of pharmacy. Emphasizes systems of measurement and basic arithmetic calculations as they relate to the practice of pharmacy. In addition, introduces the student to statistical analysis and essential mathematical concepts required for subsequent courses in pharmaceuticals.

PCT 1240 Pharmaceutical Calculations 4 QH

Introduces the application of mathematical concepts in pharmacy. Emphasizes systems of measurement and basic arithmetic calculations as they relate to the practice of pharmacy. Also introduces statistical analysis methods required for subsequent courses in pharmaceuticals and for improving problem-solving skills using computers.

PCT 1310 Pharmaceuticals Laboratory 1 1 QH

Focuses on the physicochemical principles of pharmaceutical preparations and their relationship to quality control and biopharmaceutics and pharmacokinetics. *Prereq.* PCT 1340 or concurrent enrollment.

PCT 1320 Pharmaceuticals Laboratory 2 2 QH

Focuses on the application of the fundamental principles and techniques of pharmaceuticals to the lab preparation and use of various pharmaceutical products. *Prereq.* PCT 1350 or concurrent enrollment.

PCT 1340 Pharmaceuticals 1 4 QH

Focuses on the study of physiochemical theories and principles and their application to pharmaceutical systems. Covers thermodynamics, ionic equilibria, solubility, complexation, interfacial phenomena, rheology, coarse dispersions, diffusion, membrane transport, and kinetics. *Prereq.* MTH 1108, PHY 1203, CHM 1265, and PCT 1230.

PCT 1350 Pharmaceuticals 2 5 QH

Focuses on the application of the fundamental principles of physical pharmacy to the formulation of pharmaceutical preparations. Emphasizes pharmaceutical dosage forms, including both industrial formulation and extemporaneous compounding. *Prereq.* PCT 1340.

PCT 1440 Biopharmaceutics/ Pharmacokinetics 4 QH

Acquaints students with biopharmaceutics and basic pharmacokinetics. Discusses dissolution, disintegration, general concept of one- and two-compartment models; linear and nonlinear pharmacokinetics; drug kinetics after intravenous, intramuscular, or oral administration; practical methods of one-compartment model utilizing urinary data; bioavailability; multiple-dosing kinetics; and general approaches to dosage adjustment in disease states. *Prereq.* PAH 1204 and PCT 1340.

PCT 1441 Pharmacokinetic Principles in Drug Therapy 4 QH

Covers the monitoring, development, and modification of drug dosage regimens and the pharmacokinetic factors influencing the selection of these regimens for the various therapeutic categories of drugs. Also studies decision-analytic principles applied to serum-level test characteristics and other decisions made in therapeutic-drug monitoring. *Prereq.* PCT 1440.

PCT 1801, PCT 1802, PCT 1803 Pharmaceuticals Special Research Project 4 QH each

Provides opportunity for directed study or research in one of the pharmaceutical sciences, wherein the student may undertake in-depth investigation of an

area of specialized interest. Lab fee. *Prereq. Permission of instructor(s) and program director.*

PHP 1301 Pharmaceutical Jurisprudence 4 QH
Offers a comprehensive analysis and interpretation of laws relating to the practice of pharmacy. Discusses federal and state food and drug laws, narcotics laws, Medicare and Medicaid regulations, and state pharmacy laws. *Prereq. Permission of instructor.*

PHP 1302 Pharmacy Administration I 4 QH
Covers socioeconomic aspects of pharmacy: the government's relation to the pharmaceutical industry, trends in contemporary practice, third-party payment plans, macroeconomic impact on the industry, and the interaction of current concepts in pharmacy. *Prereq. Permission of instructor.*

PHP 1303 Interpersonal Skills for Health Professionals 4 QH

Applies the skills of interpersonal communication to situations encountered in various health care settings. Provides students with an opportunity to learn to integrate specific technical competence with serious concern for personal, social, and cultural factors in illness and health care. Through the use of medical sociology literature, audio-visual materials, case analyses, and personal reflection on actual patient encounters, provides the students with an opportunity to improve interpersonal communication skills and to increase their understanding of practitioner-patient relationships, patient's needs and responses in illness and treatment, and professional behavior in practice settings.

PHP 1304 Social Pharmacology 4 QH
Studies drug-taking experiences and behaviors. Provides an overview of theories and research findings that describe the relationships between personal, social, and cultural factors and drug taking, while comparing and contrasting the social approach with the pharmacological paradigm of drug effects and the medical model of drug use. Through readings, audiovisual materials, and descriptions of personal experiences, examines the varieties of drug experiences, patterns of and reasons for drug taking of all types, and strategies for preventing drug-use problems. *Prereq. PHP 1303 or consent of instructor.*

PHP 1305 Hospital Pharmacy Management 4 QH
Examines the factors involved in the operations and management of a hospital pharmacy within the context of the total hospital structure. *Prereq. Senior standing or permission of instructor.*

PHP 1306 Community Pharmacy Management 4 QH
Focuses on the management requirements for establishing a community pharmacy. Analyzes the prevailing types of organizations, locations, leases, business organization, staffing, plant layout and design, and financial factors. *Prereq. Senior standing or permission of instructor.*

PHP 1307 Principles of Management 4 QH
Covers the fundamentals of business organization, with emphasis on the qualitative and legal aspects of

management. Includes an analysis of the marketing structure of the drug trade, forces of organizations, personnel management, and decision-making theory using nonqualitative data. *Prereq. Permission of instructor.*

PHP 1308 Financial Management 4 QH
Examines the fundamentals of accounting and finance, with emphasis on their application to retailing and community pharmacy management. Covers accounting systems, analysis of financial statements, budgets, cash flow, taxation, and finance in depth. *Prereq. Permission of instructor.*

PHP 1309 Seminar in Community Pharmacy Management 4 QH
A discussion course on all phases of community pharmacy operations with extensive utilization of the case method of instruction. *Prereq. Permission of instructor.*

PHP 1401 Drug Information and Evaluation 3 QH
Introduces the principles and practice of drug information. Covers the levels of practice, the availability of therapeutic reference sources, the use of abstracting and indexing systems, how to respond to drug information questions, and basic statistical data required to help understand the medical and pharmaceutical literature. *Prereq. Fifth-year standing or permission of instructor.*

PHP 1402 Parapharmaceuticals 2 QH
Focuses on the nature and application of various surgical devices, appliances, bandages, and hospital and sickroom supplies in patient care.

PHP 1501 Pharmacy Externship 4 QH
Involves a 520-hour (13 weeks x 40 hours/week) structured practicum in community pharmacy. Includes applied aspects of community pharmacy management; medication dispensing; and patient-oriented services such as prescription and nonprescription medication, consultation, and patient-profile monitoring. *Prereq. Fifth-year standing.*

PHP 1502 Clinical Pharmacy Clerkship 15 QH
Involves assignment to a clinical site for five full days per week to observe patient response to medication and to evaluate and advise on all factors that may modify efficacy, safety, and economy of therapy. Offers campus seminar with student presentations on current therapeutic topics. *Prereq. PHP 1602.*

PHP 1503 Professional Practice Laboratory 1 QH
Focuses on compounding and dispensing medications. Emphasizes patient counseling techniques and monitoring for appropriateness of therapy. Examines prescription compounding and screening for incompatibilities. Also includes an introduction to the preparation of intravenous solutions. *Prereq. Senior standing or permission of instructor.*

PHP 1601 Nonprescription Medication 4 QH
Provides an overview of the types of over-the-counter medications. Discusses the directions and precautions for proper use of these preparations.

PHP 1602 Pharmacotherapeutics 5 QH

Discusses common clinical lab tests, major disease states, and drug therapy for those conditions. *Prereq.* PCL 1422 and PCL 1410.

PHP 1603 Selected Topics in Clinical Pharmacy 1 4 QH

Helps students increase their understanding of selected diseases. Examines pathophysiology and diagnosis of the illness as well as drug therapy and its relation to patient compliance and education. Provides greater depth than existing clinical pharmacy courses. *Prereq.* PHP 1602 and permission of instructor.

PHP 1604 Selected Topics in Clinical Pharmacy 2 4 QH

Helps increase the student's knowledge of selected disease entities. Examines pathophysiology and diagnosis of the illness as well as drug therapy and its relation to patient compliance and education. Provides greater depth than existing clinical pharmacy courses. *Prereq.* PHP 1602 and permission of instructor.

PHP 1605 Introduction to Sterile Products 4 QH

Introduces pharmacists' role in the manufacture and clinical use of sterile products. Covers IV incompatibilities, aseptic technique, sterile room equipment, quality control, safe handling of cancer chemotherapeutic agents, and sterile product room systems and design. Discusses a variety of sterile products, including parenteral nutrition, small and large volume parenterals, irrigating solutions, cancer chemotherapeutic agents, and ophthalmic preparations. Emphasizes developing an ability to interact with other health professionals with regard to the clinical use of sterile products. Offers an opportunity to use lab equipment to prepare sterile products based on the concepts discussed in class. *Prereq.* Fourth- or fifth-year pharmacy major only.

PHP 1607 Cancer Chemotherapeutics 4 QH

Emphasizes the role of chemotherapy in the management of malignant disease. Discusses clinical applications of specific chemotherapeutic agents, with the remainder of the course concentrating on specific disease states. Covers related topics such as pain control in cancer patients, control of nausea and vomiting, principles of cancer research, cancer quackery, and adverse effects of chemotherapy. *Prereq.* Fourth-year pharmacy major or permission of instructor.

**PHP 1801, PHP 1802, PHP 1803, PHP 1804 4 QH each
Special Research Project**

Provides opportunity for directed study or research in clinical pharmacy or pharmacy administration,

wherein the student may undertake in-depth investigation of an area of specialized interest. *Prereq.* Permission of instructor.

PHP 1805 Special Research Project 3 QH

Offers directed study or research in pharmacy administration, allowing for the in-depth investigation of an area of special interest. *Prereq.* Permission of instructor.

PHP 1806 Special Research Project 2 QH

Same as PHP 1805.

PMC 1321 Pharmaceutical Analysis and Quality Control 4 QH

Introduces the methods of pharmaceutical analysis and quality control. Reviews analytical methods—such as chromatography, titration, and spectroscopy—and how they are applied to the evaluation of pharmaceutical products and dosage forms. *Prereq.* HM 1265.

PMC 1419 Medicinal Chemistry/Pharmacology 1 5 QH

Introduces the principles of pharmacology and medicinal chemistry. Discusses the major drug classes affecting the central nervous system, including anxiolytics, sedative-hypnotics, anesthetics, anticonvulsants, neuroleptics, antidepressants, and narcotic analgesics. Considers therapeutic indications, mechanisms of action, structure-activity relations, and undesirable actions including drug abuse. *Prereq.* BIO 1107, CHM 1265, PAH 1202, and PAH 1204.

PMC 1420 Antiinfectives 5 QH

Focuses on the use of drugs in the treatment of infectious disease. Includes an introduction to microbiology as it relates to the practice of pharmacy, a survey of the structures and mechanisms of actions of chemotherapeutic agents, and a review of the clinical applications of those drugs. *Prereq.* PMC 1418, PCL 1420, and PAH 1280.

PMC 1801, PMC 1802, PMC 1803 Special Research Project (Medicinal Chemistry) 4 QH each

Offers directed study or research in one of the medicinal chemistry areas, wherein students may undertake in-depth investigation of an area of specialized interest. Lab fee. *Prereq.* Permission of instructor and program director.

Health Professions

General Courses

HRA 1310 Hospital Law 2 QH

Analyzes the legal principles relating to medical and paramedical practice within a hospital environment. Discusses the common law and statutory rights of the hospital, practitioner, and patient.

HRA 1320 Language of Medicine 4 QH

Studies the language of medicine, including prefixes, suffixes, roots, abbreviations, and disease, operative, and drug terms. Also includes terms related to all area specialties. Studies the terms as they relate to a specific system of the body.

HRA 1321 Language of Health Professionals 2 QH

Studies the language of medicine and health care. Emphasizes disease, procedures, and symptomatic terms and their definitions, word construction, analysis, and application. Provides the student with an opportunity to acquire knowledge of medical terminology.

HRA 1330 Foundations of Medical Science 1 3 QH

Examines the diseases most commonly encountered in the hospital, the clinic, and the home. Emphasizes disease processes that affect the body as a whole, including inflammation, immune process, infection, genetic disease, benign and malignant abnormal growth, mental illness, blood and lymph disorders, and central nervous system disease.

HRA 1340 Foundations of Medical Science 2 3 QH

Examines the diseases most commonly encountered in the hospital, the clinic, and the home. Emphasizes disease processes that affect the body systems, including the coronary, respiratory, gastrointestinal, kidney, reproductive, hepatic, and musculoskeletal systems. *Prereq.* HRA 1330.

Toxicology

TOX 1100 Toxicology Orientation 1 QH

Introduces toxicology as it relates to regulatory, environmental, forensic, and clinical issues. Focuses on general principles of toxicology and their application to determining the hazards of toxicants in the workplace, the home, and the environment.

Tox 1101 Current Topics in Toxicology 1 QH

Discusses topics of interest to toxicology, pharmacy, biology, chemistry, nursing, and related majors. Selects topics from current research that span regulatory, public health, and environmental issues. Explores other toxicology-related topics.

TOX 1131 Laboratory Animal Science 4 QH

Presents a comprehensive examination of the role of the lab animal in biomedical research. Includes historical and legislative aspects of animal research, basic anatomy and physiology, genetics and nutrition, physiological parameters, animal health and disease, and experimental protocols. *Prereq.* BIO 1260, PAH 1204, and/or permission of instructor.

TOX 1300 Clinical Toxicology 4 QH

Examines the potential toxicity of drugs, commercial products, and environmental agents. Focuses on clinical manifestations, mechanisms of toxicity, principles of treatment, and prevention of acute and chronic poisonings. *Prereq.* PMC 1418.

TOX 1301 Fundamental Principles of Systemic Toxicology 4 QH

Presents the principles of toxicology from an organ-system perspective. Focuses on the basic concepts used to evaluate toxicity, the mode of injury at the organ and cellular levels, and the basic subcellular

mechanisms through which toxic agents produce damaging effects. Uses recent toxicological literature to introduce the concepts needed to evaluate toxicity through the analysis of data. *Prereq.* PMC 1418.

TOX 1302 Chemical and Analytical Toxicology 4 QH

Continues TOX 1301. Places additional emphasis on the interpretation of the toxicological literature to evaluate the risk involved from exposure to prototype chemicals. Uses structure activity and biochemical methods of assessment to evaluate the toxicity of major classes of chemical compounds. *Prereq.* PMC 1418 and TOX 1301.

TOX 1322 Biochemical Toxicology Laboratory 4 QH

Introduces the student to investigational methods for assessing toxicity; helps develop the student's ability to analyze and interpret data generated in the lab and in the literature; and helps the student develop technical report-writing skills. Uses rodents as a model for toxic insult. Examines hepatotoxicity, neurotoxicity, teratogenicity, and other toxic manifestations at the whole-animal, whole-tissue, and biochemical levels. *Prereq.* TOX 1300, TOX 1301, or TOX 1302.

TOX 1801, TOX 1802, TOX 1803 Special Topics 4 QH each

Selected areas of toxicology will be explored. These may include research, seminars, comparative analysis of data, or faculty-guided programs.

Medical Laboratory Science

The medical laboratory professional courses are taught by University faculty and supportive clinical faculty.

MLS 1101 Medical Laboratory Science Orientation 1 1 QH

Focuses on the history and development of the medical lab science profession; includes an introduction to medical terminology.

MLS 1102 Medical Laboratory Science Orientation 2 1 QH

Continues discussion of topics introduced in MLS 1101, with the addition of a review of mathematics and metric-unit calculations.

MLS 1109 Foundations of Clinical Laboratory Science 4 QH

Examines basic lab methods employed in primary care, including urinalysis, gram staining, hematocrit, hemoglobin, sedimentation rate, white cell count, and differential. *Prereq. Admission to physician assistant program or permission by instructor.*

MLS 1111 Basic Medical Laboratory Science Urinalysis 3 QH

Surveys basic medical lab science. Covers principles and theories of renal physiology, with lab emphasis on techniques for chemical and microscopic detection of normal and abnormal constituents. Lab fee. *Prereq. BIO 1107 and CHM 1122.*

MLS 1123 Basic Hematology 1 2 QH

Introduces hematology procedures and principles; hemoglobin, hematocrit, white and red blood cell counts; and white cell differentiation. Replaces lecture portion of MLS 1121. *Prereq. BIO 1107 and CHM 1122.*

MLS 1124 Basic Hematology 2 2 QH

Studies the principles and procedures of hematology, emphasizing hematologic cell maturation, morphology, and basic hemostasis. Replaces lecture portion of MLS 1122. *Prereq. MLS 1123 or MLS 1321.*

MLS 1132 Basic Immunohematology 3 QH

Teaches the principles of immunohematology with specific application to the ABO and Rh blood group system, antibody detection, and crossmatch design. Studies basic blood bank techniques including blood typing and crossmatching. Replaces immunohematology lecture portion of MLS 1131. *Prereq. BIO 1107, MLS 1171 and MLS 1271.*

MLS 1141 Basic Medical Laboratory Science Clinical Microbiology 6 QH

Focuses on basic principles and techniques of organism isolation, cultivation, and identification from clinical specimens. Discusses elementary serologic procedures. Lab fee. *Prereq. CHM 1122 and BIO 1107.*

MLS 1142 Basic Clinical Microbiology 1 3 QH

Introduces the principles and techniques of organism isolation, cultivation, and identification from clinical specimens. Replaces lecture portion of MLS 1141. *Prereq. BIO 1107, CHM 1122, MLS 1171, and MLS 1271.*

MLS 1152 Basic Clinical Chemistry and Instrumentation 4 QH

Covers the principles of clinical chemistry with application to procedures and techniques. In laboratory work, emphasizes the clinical significance and common methods of quantitating selected important analyses. Replaces lecture portion of MLS 1151. *Prereq. CHM 1122 and MLS 1112 or MLS 1311.*

MLS 1171 Basic Immunology 1 QH

Covers the concepts of medical immunology, including the relationship between disease, immune response, and laboratory procedures. Encompasses the concepts of antigen and antibody structure and relationship, specific and nonspecific host response, and common laboratory methods for detecting antibodies and antigens. Includes material previously presented as part of MLS 1131.

MLS 1223 Basic Hematology 1 Lab 1 QH

Laboratory for MLS 1123.

MLS 1224 Basic Hematology 2 Lab 1 QH

Laboratory for MLS 1124.

MLS 1232 Basic Immunohematology Lab 1 QH

Laboratory for MLS 1132.

MLS 1242 Basic Clinical Microbiology 1 Lab 1 QH

Laboratory for MLS 1142.

MLS 1252 Basic Clinical Chemistry and Instrumentation Lab 1 QH

Laboratory for MLS 1152.

MLS 1271 Basic Immunology Lab 1 QH

Laboratory for MLS 1171.

MLS 1311 Basic Medical Laboratory Science Urinalysis 2 QH

Introduces basic medical laboratory science. Examines principles and theories of renal physiology, with laboratory emphasis on techniques for chemical and microscopic detection of normal and abnormal urinary tract constituents. Lab fee. *Prereq. CHM 1122 and BIO 1107.*

MLS 1321 Basic MLS Hematology 1 2 QH

Introduces basic hematology procedures and principles, including hemoglobin, hematocrit, white and red blood cell counts, and white cell differentiation. Lab fee. *Prereq. CHM 1122 and BIO 1107.*

MLS 1322 Basic MLS Hematology 2 2 QH

Covers principles and procedures of basic medical lab hematology, including basic hemostasis. Lab fee. *Prereq. MLS 1121 or MLS 1321.*

MLS 1323 Advanced Hemostasis Techniques 2 QH

Focuses on advanced hemostatic techniques. Stresses theory and methodology, along with interpretation of lab results. Lab fee. *Prereq. MLS 1122, MLS 1322, or permission of instructor.*

MLS 1324 Histochemistry**2 QH**

Covers the histochemistry of hemic cells and techniques used in diagnosis of hematological disorders. Lab fee. *Prereq.* *MLS 1621, MLS 4341, or permission of instructor.*

MLS 1330 Basic MLS Immunohematology**2 QH**

Covers basic principles in immunohematology and related techniques, with particular emphasis on those procedures used in blood banking. Lab fee. *Prereq.* *BIO 1107.*

MLS 1331 Basic MLS Clinical Immunology**3 QH**

Covers basic principles of immunology, with laboratory emphasis on immunodiagnostic techniques currently used in clinical lab practice. Lab fee. *Prereq.* *BIO 1107 and CHM 1122.*

MLS 1333 Immunohematology**2 QH**

Offers advanced studies in antigen-antibody detection and problem solving through immunohematological tests. Discusses related hematologic disorders and the medical/legal aspects of blood banking. Lab fee. *Prereq.* *MLS 1131; or MLS 1330 and MLS 1331.*

MLS 1341 Basic MLS Clinical Microbiology**4 QH**

Covers basic principles and techniques or organism isolation, cultivation, and identification from clinical specimens. Discusses elementary serologic procedures. Lab fee. *Prereq.* *BIO 1107 and CHM 1122.*

MLS 1351 Basic Medical Laboratory Science Clinical Chemistry and Instrumentation**4 QH**

Examines principles, procedures, and techniques of basic clinical chemistry and instrumentation, with lab emphasis on instrumental analysis of clinical specimens. Lab fee. *Prereq.* *CHM 1221; MLS 1111 or MLS 1311.*

MLS 1412 MLT Special Topics—Applied Microscopy**2 QH**

Offers clinical practicum in applied urinalysis, parasitology, and mycology at an affiliated hospital providing MLT(ASCP)- and CLT(NCA)-level instruction. *Prereq.* *Admission to MLT Clinical Program.*

MLS 1423 MLT Applied Study in Hematology**2 QH**

Offers clinical practicum in hematology and coagulation at an affiliated hospital providing MLT(ASCP)- and CLT(NCA)-level instruction. *Prereq.* *Admission to MLT Clinical Program.*

MLS 1432 MLT Applied Study in Blood Banking**2 QH**

Offers clinical practicum in blood banking at an affiliated hospital providing MLT(ASCP)- and CLT(NCA)-level instruction. *Prereq.* *Admission to MLT Clinical Program.*

MLS 1442 MLT Applied Study in Clinical Microbiology**2 QH**

Offers clinical practicum in microbiology at an affiliated hospital providing MLT(ASCP)- and CLT(NCA)-level instruction. *Prereq.* *Admission to MLT Clinical Program.*

MLS 1452 MLT Applied Study in Clinical Chemistry**2 QH**

Offers clinical practicum in clinical chemistry at an affiliated hospital providing MLT(ASCP)- and

CLT(NCA)-level instruction. *Prereq.* *Admission to MLT Clinical Program.*

MLS 1480 MLT Seminar I**2 QH**

Offers a basic introduction to correlation of laboratory findings in hematology, blood banking, microbiology, and clinical chemistry, with appropriate referrals of lab information in working situation. Examines basic use of quality control. *Prereq.* *Admission to MLT Clinical Program.*

MLS 1523 Hematology MT Applied Study**4 QH**

Offers clinical practicum in applied hematology at an affiliated hospital providing for MT(ASCP)- and CLS(NCA)-level instruction. *Prereq.* *Admission to MT Clinical Program.*

MLS 1532 Immunohematology MT Applied Study**3 QH**

Offers clinical practicum in applied immunohematology at an affiliated hospital providing MT(ASCP)- and CLS(NCA)-level instruction. *Prereq.* *Admission to MT Clinical Program.*

MLS 1544 Clinical Microbiology MT Applied Study**7 QH**

Offers clinical practicum in applied microbiology at an affiliated hospital providing MT(ASCP)- and CLS(NCA)-level instruction. *Prereq.* *Admission to MT Clinical Program.*

MLS 1552 Clinical Chemistry MT Applied Study**7 QH**

Offers clinical practicum in applied clinical chemistry at an affiliated hospital providing MT(ASCP)- and CLS(NCA)-level instruction. *Prereq.* *Admission to MT Clinical Program.*

MLS 1573 Clinical Immunology MT Applied Study 1**1 QH**

Offers clinical practicum in applied clinical immunology at an affiliated hospital providing MT (ASCP) and CLS (NCA)-level instruction. *Prereq.* *Admission to MT Clinical program.*

MLS 1574 Clinical Immunology MT Applied Study 2**1 QH**

Continues MLS 1573.

MLS 1621 Advanced Hematology I**3 QH**

Studies physiology of blood cells and bone marrow; reviews physiology of blood hemopoiesis; discusses hematologic results as they relate to normal, anemic, and leukemic conditions. *Prereq.* *MLS 1124 or permission of instructor.*

MLS 1622 Advanced Hematology 2—Hemostasis**2 QH**

Offers advanced studies in hemostasis, with emphasis on factor identification and problem solving of hemostatic problems. *Prereq.* *MLS 1124 or permission of instructor.*

MLS 1631 Advanced Immunohematology**2 QH**

Examines blood group systems, antibody identification, and advanced immunohematologic principles and procedures. Presents case studies. *Prereq.* *MLS 1332 or MLS 1132.*

MLS 1642 Medical Parasitology**3 QH**

Focuses on lab identification of significant human parasites. Examines life cycles related to mode of infestation, effects on humans, and diagnostic form. Lab fee. *Prereq.* *MLS 1141.*

MLS 1648 Advanced Clinical Microbiology 4 QH

Examines host and microbial interactions in disease produced by viruses, rickettsia, chlamydia, mycoplasma, mycobacteria, anaerobic bacteria, and actinomycetes. Also covers host and microbial interactions in gastrointestinal, genitourinary, and respiratory tract infections. Discusses disease states, diagnostic procedures, and antimicrobial testing. Combines MLS 1645 and MLS 1646. *Prereq.* *MLS 1142 and MLS 1143.*

MLS 1654 Advanced Clinical Chemistry 1 4 QH

Includes current methodologies and instrumentation used in clinical chemistry to evaluate hormonal conditions, drug level monitoring, amino acids, proteins, enzymes, and carbohydrates. Combines content included in MLS 1651 and MLS 1652. *Prereq.* *MLS 1152, MLS 1351, or permission of the instructor.*

MLS 1655 Advanced Clinical Chemistry 2 4 QH

Studies metabolism and procedures for nucleic acids, lipids, acid-base balance, hepatic, renal and gastrointestinal systems, as well as vitamin and trace metal blood levels. Combines content included in MLS 1652 and MLS 1653. *Prereq.* *MLS 1654 or permission of instructor.*

MLS 1661 Medical Laboratory Science Education 2 QH

Surveys current topics in medical lab science education: developing objectives, methods of evaluation and certification, clinical instruction and evaluation, medical lab science curricula, and use of media and other methods of instruction. *Prereq.* *Completion of clinical program.*

MLS 1665 Medical Laboratory Management 2 QH

Surveys factors that relate to effective lab administration: hospital organizational structure, principles of management and supervision, cost accounting, purchasing, inspection guidelines, legal responsibilities, and personnel relations. *Prereq.* *Completion of clinical program.*

MLS 1672 Immunopathology 3 QH

Covers the situations in which the host defense response produces the symptoms of disease. Discusses conditions that result from immunodeficiency. Explains the role of the immune system in transplant rejection. Describes neoplasms of the immune system and discusses laboratory procedures used in the diagnosis and management of these conditions. *Prereq.* *MLS 1171.*

MLS 1680 MLS Special Topics 2 QH

Discusses current topics in the clinical lab. *Prereq.* *MLS 1111, MLS 1121, MLS 1122, MLS 1131, MLS 1141, and MLS 1151.*

MLS 1681 MLS Senior Seminar 2 QH

Reviews current undergraduate medical lab science topics.

MLS 1890 Undergraduate Research 2 QH

Examines special problems in lab medicine involving individual research under the direction of a faculty member. *Prereq.* *Special permission.*

MLS 1891 MLS Current Concepts 1 QH

Discusses topics determined by recent advances in medical lab science.

Health Record Administration

HRA 1100 Orientation to Medical Records 1 1 QH

Focuses on the issues, activities, and opportunities in the medical record profession.

HRA 1410 Health Record Science 1 4 QH

Introduces health record science, the history of medicine, and the historical development of the health-care field. Examines the medical record department, the professional medical record association, and the organization and functions of the admitting office and medical record department. Discusses definitions, standards, and development of a medical record, emphasizing its content, format, completeness, analysis, and uses. *Prereq.* *Two years of arts and sciences.*

HRA 1420 Health Record Science 2 4 QH

Focuses on the organization of hospitals and the medical staff, accreditation and regulation of health-care facilities, principles of law related to patient care and medical records, and security and preservation of records and hospital statistics. *Prereq.* *HRA 1410.*

HRA 1430 Health Record Science 3 4 QH

Studies in depth the standardized nomenclature of diseases and operations theory and systems, em-

phasizing diagnostic and procedure coding with ICD-9-CM. Also covers health-facility compilation and uses of data indices. *Prereq.* *HRA 1420.*

HRA 1440 Advanced Health Record Science 4 4 QH

Covers advanced aspects of health/medical record science. Focuses on the management of record systems in ambulatory, long-term, home care, and psychiatric settings. *Prereq.* *HRA 1430.*

HRA 1450 Applied Health Records Directed Practice 1 3 QH

Offers clinical practicum in medical record science in a general hospital. *Prereq.* *HRA 1430.*

HRA 1460 Applied Health Records Directed Practice 2 2 QH

Offers clinical practicum in medical record science in specialized health settings. *Prereq.* *HRA 1450.*

HRA 1471 Applied Health Records Science 3 3 QH

Offers clinical practicum in health/medical records management in the health-care facility.

HRA 1510 Management of Health Record Services 1 4 QH

Presents introduction to management in health care. Emphasizes organization and management of health

information departments in hospitals. Provides overview of management theory, systems analysis, and problem solving. Examines tools and techniques of management; organization charts, goals, and objectives; policies and procedures; work analysis. Also covers managerial behavior, Macgregor, Maslow, Hersey Blanchard, and Blake Mouton.

HRA 1520 Management of Health Record Services 2 **4 QH**

Focuses on the medical record department within the health-care setting. Examines budget and cost-control mechanisms, office ergonomics and layout, principles of forms design, and managing transcription services. Provides an opportunity to develop the technical skills necessary to plan and analyze budgets, design office layouts, and design forms. *Prereq.* HRA 1510.

HRA 1530 Management of Health Record Services 3 **4 QH**

Focuses on the medical record department within a health-care setting. Examines employee-orientation programs, training programs, in-service education, interviewing, hiring, organized labor and collective bargaining, motivating and disciplining employees, and communication skills. Provides opportunity for students to develop employee orientation and training programs and in-service presentations. Uses role playing and case studies to develop skills in interviewing, hiring, counseling, motivating, and disciplining employees. *Prereq.* HRA 1520 or permission of the instructor.

HRA 1540 Quality Assurance **4 QH**

Focuses on the role of the professional review organizations and JCAHO (Joint Commission on Accreditation of Health Care Organizations) in quality assurance and on issues and problems related to designing, implementing, and evaluating quality-assurance and risk-management programs for health-care facilities. Provides opportunities for students to gain technical skills needed to carry out all aspects of the quality-assurance audit process. Emphasizes the quality-assurance professional's role as facilitator for physicians and other health-care professionals in the quality-assurance process. *Prereq.* HRA 1320, HRA 1430, and HRA 1440, or permission of the instructor.

HRA 1560 Seminar in Health Records **2 QH**

Uses case studies and discussion to integrate the discrete skills and knowledge of the professional curriculum into a meaningful whole by analysis of real and hypothetical problems. Emphasizes coordination between the seminar and applied medical record science. *Prereq.* Senior status.

HRA 1570 The Health Record Professional: Issues and Problems **2 QH**

Provides senior health record students with information on a range of topics germane to their professional roles but that may not have been included in other professional courses. *Prereq.* Senior status.

HRA 1580 Training and Development for Health Care Professionals **2 QH**

Prepares the health-record administration student to function as an in-service educator. Covers needs assessment, teaching techniques, and evaluation methodology.

HRA 1610 Introduction to Data Processing for the Health Professions **4 QH**

Provides an introduction to computer technology and its application to health-information management. Exposes students to information analysis and processing, emphasizing file management through the use of data-base management and spreadsheet software in computer lab sessions. Addresses the use of generic software for the development of health-care applications, current applications in health facilities, future trends, and societal issues.

HRA 1620 Systems Analysis **4 QH**

Introduces systems analysis, its concepts, and techniques. Stresses special application to health-record management throughout the course. *Prereq.* HRA 1550.

HRA 1630 Introduction to Health Data Research **4 QH**

Provides an introduction to the research process and to statistical analysis of research data. Also exposes students to research studies to develop an understanding of the research process, statistical analysis of health data for research studies, and evaluation of the validity and reliability of health-related research studies.

HRA 1640 Medical Computer Applications **4 QH**

Examines computer applications and management of computer applications in health-care facilities, emphasizing health information systems related to medical records. Applies information flow in health facilities of clinical patient data to the principles of the information system life cycle, emphasizing systems analysis process applied to medical care and management medical record department. Emphasizes the role of the Registered Record Administrator (RHA) as an active team member.

HRA 1800 Independent Study **4 QH**

Gives students an opportunity to explore in depth a subject relevant to their interests. Gives them the opportunity to study a problem, present a proposal, carry out a study or a course of action, and prepare both written and oral presentations of their activities. *Prereq.* Permission of instructor.

HRA 1810 HRA 1820 Special Topics 1, 2 **2 QH**

Provides specialized study in medical records.

Respiratory Therapy

RTH 1111 Respiratory Therapy Seminar 1

1 QH

Introduces the beginning respiratory therapy student to the role of respiratory therapists in health-care delivery.

RTH 1112 Respiratory Therapy Seminar 2

1 QH

Introduces the beginning student to therapeutic modalities of respiratory care.

RTH 1113 Respiratory Therapy Seminar 3

1 QH

Continues discussion of topics introduced in RTH 1112, including introduction to life-support systems.

RTH 1211 Practicum in Respiratory Care

4 QH

The first course in a sequence of five designed to provide clinical experience in hospitals. Focuses on respiratory care for noncritical patients. Emphasizes infection control, medical gas administration, humidification of medical gases, aerosol therapy, chest physiotherapy, deep breathing treatments, and the administration of aerosol medications. *Prereq.* RTH 1331, RTH 1301, RTH 1332 concurrently, and RTH 1302 concurrently.

RTH 1301 Professional Practice Laboratory 1

1 QH

Provides practice in basic care skills through laboratory exercises and simulation of patient-care situations. Lab fee. *Prereq.* RTH 1331 concurrently.

RTH 1302 Professional Practice Laboratory 2

1 QH

Provides students with hands-on experience in working with respiratory therapy equipment. Sets up simulated patient-management problems in the lab to provide problem-solving experience. Lab fee. *Prereq.* RTH 1301, RTH 1332 concurrently.

RTH 1312 Practicum in Respiratory Care

4 QH

The second course in a sequence of five directly related to the clinical practice of various modalities of respiratory care. Focuses on treating patients with more complex cardiorespiratory disorders. *Prereq.* RTH 1332, RTH 1302, RTH 1433 concurrently, and RTH 1403.

RTH 1313 Practicum in Respiratory Care

6 QH

Provides clinical experience in hospitals. Emphasizes respiratory care for critical patients. Reviews advanced respiratory-care topics such as airway care, mechanical ventilation, and positive end expiratory pressure. *Prereq.* RTH 1433, RTH 1302, RTH 1434 concurrently, RTH 1404 concurrently.

RTH 1320 Cardiopulmonary Physiology

4 QH

Provides a detailed introduction to the clinical diagnostic procedures employed in evaluating cardiopulmonary patients and description of the etiology, pathophysiology, diagnosis, and treatment of major cardiopulmonary diseases. *Prereq.* Satisfactory completion of the first-year courses.

RTH 1321 Cardiopulmonary Disease

4 QH

Introduces clinical diagnostic procedures employed in evaluating cardiopulmonary patients and description of the etiology, pathophysiology, diagnosis, and treatment of major cardiopulmonary diseases. *Prereq.* Satisfactory completion of the first-year courses.

RTH 1331 Introduction to Patient Care

4 QH

Provides an opportunity for the student to gain knowledge and understanding of basic patient-care skills, including moving and positioning of patients, infection control, basic observation and assessment skills, and familiarity with the techniques of cardiopulmonary resuscitation. Also provides an opportunity for the development of the student's interpersonal and communication skills.

RTH 1332 Introduction to Respiratory Care

4 QH

Basic to all other professional respiratory therapy courses. Focuses on the theory and application of medical gas administration and humidity/aerosol therapy. *Prereq.* RTH 1331 and PCL 1309 concurrently.

RTH 1403 Professional Practice Laboratory 3

1 QH

Provides students with hands-on experience with respiratory therapy procedures. Sets up simulated patient-management problems in the lab to provide problem-solving experience. Lab fee. *Prereq.* RTH 1302, RTH 1433 concurrently.

RTH 1404 Professional Practice Laboratory 4

1 QH

Provides students with an opportunity to acquire experience in working with respiratory therapy life support equipment. Sets up simulated critical-care problems in the lab to provide problem-solving experience. Lab fee. *Prereq.* RTH 1403, RTH 1434 concurrently.

RTH 1414 Clinical Seminar 1

1 QH

Discusses clinical topics and respiratory-care problems encountered during clinical practice in the hospitals. *Prereq.* RTH 1312 concurrently.

RTH 1415 Clinical Seminar 2

1 QH

Discusses clinical topics and critical-care problems encountered during clinical practice in the hospital. *Prereq.* RTH 1313 concurrently.

RTH 1433 Respiratory Care for the Medical and Surgical Patient

4 QH

Continues the introduction to respiratory therapy, as the didactic portion of beginning clinical experience on noncritical patients. Focuses on respiratory-care problems following major surgery and those problems related to medical patients. *Prereq.* RTH 1332.

RTH 1434 Respiratory Care for the Critical Patient

4 QH

The last in a sequence of three directly related to the theory of respiratory therapy procedures; designed as the didactic portion of clinical experience on critical patients. Focuses on respiratory-care problems encountered with patients in intensive care units. *Prereq.* RTH 1433.

RTH 1435 Introduction to Perinatal/Pediatric Respiratory Care

2 QH

Provides the student with the opportunity to acquire knowledge and understanding of human cardiopulmonary development from the time of conception through childhood years. Emphasizes normal as well

as abnormal manifestations of pregnancy, labor, and the process of delivering. Examines methods and techniques of assessment and delivery of respiratory care related to the pediatric patient's pathophysiology of cardiopulmonary disease. *Prereq.* RTH 1434.

RTH 1505 Cardiopulmonary Laboratory Practice 1 QH

The lab portion of Cardiopulmonary Laboratory Technology. Focuses on the techniques of pulmonary functions testing, blood gas analysis, and cardiovascular testing commonly done in the clinical setting. Lab fee. *Prereq.* RTH 1535 concurrently.

RTH 1510 Perfusion Technology Practicum 1 6 QH

Provides perfusion technology students with the opportunity to develop, practice, and master skills required to perform extracorporeal circulation procedures. Also includes, but is not limited to, current methods in autotransfusion, myocardial preservation, and intra-aortic balloon support. *Prereq.* RTH 1570.

RTH 1511 Practicum in Critical Care 4 QH

Allows the student to select an area of emphasis from among the following: intensive care units, neonatal-pediatrics, or extracorporeal membrane oxygenation. During the practicum courses, provides students with an opportunity to work in their specialty areas. *Prereq.* RTH 1574, RTH 1578.

RTH 1512 Practicum in Critical Care 4 QH

Continues RTH 1511. *Prereq.* RTH 1511.

RTH 1515 Perfusion Technology Practicum 2 6 QH

Continues RTH 1510. *Prereq.* RTH 1514, RTH 1571, and RTH 1572.

RTH 1516 Advanced Clinical Seminar 1 1 QH

Complements RTH 1571. Discusses current clinical problems related to life-support systems problems encountered in the hospital. *Prereq.* RTH 1571 concurrently.

RTH 1517 Advanced Clinical Seminar 2 1 QH

Complements a professional elective taken concurrently. Discusses current clinical problems and research related to problems encountered in the hospital. *Prereq.* RTH 1572 concurrently.

RTH 1518 Advanced Clinical Seminar 3 1 QH

Complements RTH 1511. Discusses current clinical problems and emphasizes research related to critical-care problems. *Prereq.* RTH 1511 concurrently.

RTH 1519 Advanced Clinical Seminar 4 1 QH

Continues RTH 1518. Complements RTH 1512. *Prereq.* RTH 1512 concurrently.

RTH 1535 Cardiopulmonary Laboratory Techniques 4 QH

Provides the student with an opportunity to gain knowledge and background in principles, theory, and procedures encountered in a clinical cardiopulmonary lab. Focuses on the physiological foundations of cardiopulmonary testing. *Prereq.* RTH 1321 and permission of instructor.

RTH 1570 Fundamentals of Perfusion Technology 4 QH

Applies biologic, pharmacologic, and physical principles to extracorporeal cardiopulmonary support. Focuses on the basic theory and instrumentation of perfusion technology, emphasizing circuit design and function, oxygenator theory, pump dynamics, blood recovery and autotransfusion procedures, myocardial protection techniques, intraaortic counterpulsation, aseptic techniques, and surgical procedures. Provides an opportunity to work with perfusion equipment and to develop the psychomotor skills necessary to implement perfusion procedures. Lab.

RTH 1571 Advanced Life Support Systems 1 4 QH

Introduces students to selected techniques of advanced life support applied to the critically ill patient. *Prereq.* RTH 1434.

RTH 1572 Perfusion Technology 4 QH

Introduces students specializing in perfusion technology to the theory, principles, and concepts of cardiovascular perfusion. *Prereq.* RTH 1571.

RTH 1574 Advanced Clinical Physiology 4 QH

Provides respiratory therapy students with an opportunity for an in-depth exposure to medical physiology, based on the concept of the homeostatic state and its application to the clinical setting. *Prereq.* PAH 1204 and permission of instructor.

RTH 1576 Neonatal Respiratory Care 4 QH

Provides the student with an understanding of the methods and techniques of respiratory therapy for neonatal patients. Emphasizes mechanical ventilation, newborn care, and the respiratory distress syndrome. *Prereq.* RTH 1574.

RTH 1578 Advanced Medical Monitoring 4 QH

Provides students with an opportunity for an in-depth exposure to the theory and application of physiologic monitoring systems and their use in critical-care settings. *Prereq.* RTH 1574.

RTH 1631 Management of Respiratory Care Departments 4 QH

Exposes respiratory therapy students to the techniques, theories, and tools of management that will enable them to develop a workable management system for respiratory-care departments. Provides an overview and a basic conceptual understanding of the role and the task of managing. Deals with the functions, duties, and responsibilities of managers and the things managers must do. Alternates theoretical considerations with practical applicants (cases, questions, and exercises) to enhance learning.

RTH 1632 Methods and Materials of Teaching Respiratory Therapy 4 QH

Studies the systems approach to teaching respiratory therapy. Covers development of instructional goals based on a needs assessment, behavioral learning objectives, instructional strategies, and evaluation instruments. Emphasizes the use of criterion-referenced measurement strategies to evaluate mastery of clinical skills.

RTH 1633 Student Teaching and Seminar 4 QH

Involves part-time participation (12 hours per week) in a supervised respiratory-therapy learning experience designed to provide practice with didactic, laboratory, and clinical teaching. Gives students an opportunity to demonstrate, evaluate, and develop their teaching skills. Through a one-hour seminar held weekly, discusses problems encountered in the classroom, lab, and hospital.

RTH 1634 Rehabilitation of Patients with Respiratory Disorders 4 QH

Applies a broad definition of rehabilitation to the life situations of patients with respiratory disorders. Gives students the opportunity to learn specific skills that address the recognition and management of acute and chronic problems. Develops model systems of psychosocial as well as physical support based on these skills. Open to students in health or human service disciplines who have had clinical or field experience.

RTH 1635 Practicum in Pediatric Pulmonary Rehabilitation 1 QH

Involves counselorship under medical direction at a one-week summer camp for children with severe pulmonary disorders. Requires students to apply skills

acquired in RTH 1634 in residential camp situation and to respond to medical or psychosocial problems in a manner consistent with current methods in his/her discipline. Involves group and individual discussions with the instructor to clarify insights and experiences. Requires daily case reports to document the learning process. *Prereq.* RTH 1634 or permission of instructor; enrollment limited.

RTH 1801 Directed Independent Study 1 2 QH

Offers directed study in a student's major wherein in-depth investigation of a special interest area is undertaken. *Prereq.* RTH 1511 concurrently.

RTH 1802 Directed Independent Study 2 2 QH

Offers directed study in a student's major wherein in-depth investigation of a special interest area is undertaken. *Prereq.* RTH 1512 concurrently.

RTH 1810 Continuation of Clinical 0 QH

This six-week noncredit clinical course provides perfusion technology students with the opportunity to clear grades of I (Incomplete) in RTH 1515, Practicum in Perfusion Technology 2. At the end of the six-week period, students will be reevaluated using the criteria developed for RTH 1515, and I grades will be changed to the grades earned at that time.

Nursing

NUR 1100 Introduction to Professional Nursing and the Health System 4 QH

Surveys the social, political, and economic forces that influence the nursing profession. Considers the historical development of nursing and its role and contribution to American society. Introduces the United States health sector and the social, political, and economic factors that affect health-care delivery. Views concepts of health and illness from their meanings to the general population. Encourages students to explore individual goals in the nursing profession.

NUR 1101 Introduction to the Theoretical Basis for Nursing Practice 4 QH

Introduces the concepts and theories generally used in professional nursing practice and the major concepts in the nursing paradigm. Surveys the conceptual framework of the College of Nursing, the Roy Adaptation Model, and selected major theorists. Builds on the concepts of health, wellness, and illness. Introduces nursing processes and skills associated with data collection. Discusses communication as essential to professional role behavior. *Prereq.* NUR 1100.

NUR 1102 Introduction to Human Nutrition 4 QH

Explores the fundamental role of nutrition in promoting health. Studies the physiological functions of nutrients, their food sources, and recommended intakes for different age groups. Also examines the possible health significance of non-nutritive components of foods. Utilizes principles from the humanities and sciences in developing nutrition concepts.

Introduces the use of different diet-assessment tools to assist individuals in meeting nutrient and energy needs. Encourages students to examine their own food choices and how those choices translate into meeting recommended nutrient and energy needs. Discusses the origins of food habits and the relevance of nutrition counseling and education in nursing practice. *Prereq.* NUR 1100 or permission of instructor.

NUR 1200 Nursing Basic Human Needs 1 6 QH

Gives the opportunity to explore the professional role in a clinical setting. Building on knowledge of the Roy Adaptation Model, allows students to implement the nursing process in the four adaptive modes and also focus on psychomotor development skills. Offers students the chance to provide basic nursing care to selected clients. Through lectures and assignments, helps students utilize and explain scientific and conceptual bases for nursing activities. Explores professional responsibility in a legal and ethical framework with specific attention to the students' individual role development. *Prereq.* BIO 1115, BIO 1152, BIO 1153, CHM 1111, CHM 1112, NUR 1100, NUR 1101, NUR 1102, and sophomore standing.

NUR 1201 Nursing Basic Human Needs 2 6 QH

Allows students to continue developing in the professional role in a clinical setting. Emphasizes physical assessment and patient education. Offers students the chance to provide basic nursing care and to continue to strengthen their understanding of the nursing process by using the Roy Adaptation Model.

Through lectures and assignments, helps students expand their scientific and conceptual basis for nursing activities. *Prereq.* BIO 1120, BIO 1154, NUR 1200, and sophomore standing.

NUR 1202 Introduction to Pathophysiological Concepts for Clinical Nursing 4 QH

Uses Roy's Physiological Mode as a framework to focus on how the human body uses its adaptive power to maintain a steady state and how alterations cause a disruption in normal cellular processes. Reinforces an understanding of disease processes and their implications for nursing practice. *Prereq.* BIO 1115, BIO 1152, BIO 1153, BIO 1154, and sophomore standing.

NUR 1300 Common Problems 7 QH

Focuses on specific physiologic alterations and psychosocial adaptation in the health of adult clients and their families using the Roy Adaptation Model. Through the clinical practicum, provides the opportunity to administer nursing care by collaborating with faculty, clients, nurses, and other health-team members. Allows students, under faculty guidance and in an acute clinical setting, to assess, plan, implement, and evaluate nursing care for selected adult clients using the Roy Adaptation Model. *Prereq.* BIO 1254, NUR 1201, PSY 1111, PSY 1112, and middle standing.

NUR 1301 Psychiatric/Mental Health Nursing 7 QH

Examines the process used by the professional nurse in facilitating the adaptive responses and goal attainment of human systems. Specifically, focuses on the study of self-concept, role functioning, and interdependence among individuals, families, and groups. Studies the interpersonal process of professional nursing and how the nurse works with client systems in their striving toward survival, growth, reproduction, and mastery. Discusses how within this process, adaptive responses are enhanced and ineffective responses are altered. Uses the Roy Adaptation Model as the framework. *Prereq.* BIO 1254, NUR 1201, PSY 1111, PSY 1112, and middle standing.

NUR 1302 Transition 9 QH

Introduces registered nurse students to the purposes, philosophy, and conceptual framework of the baccalaureate degree program. Provides students the opportunity to complement and validate, through guided study, their knowledge of professional roles and role conflicts, communication and group process, and principles of teaching, learning, and evaluation. Uses the Roy Adaptation Model in providing nursing care, specifically with aging, chronically ill, and dying patients. Also discusses nutritional needs, with specific emphasis on aged, acute, and chronically ill individuals. *Prereq.* BIO 1120, BIO 1140, BIO 1141, BIO 1253, BIO 1255, CHM 1111, CHM 1112, PSY 1111, PSY 1112, and registered nurse license.

NUR 1303 Life Crises: Analysis and Response 4 QH

Considers personal, family, and community crises identified from literature, health agency clientele, and student sources. Uses concepts from nursing, sociology, anthropology, and social psychology to

assess critically the individual's experience of crisis and the approaches used by providers in human-service systems to help people in crisis. Gives students in consumer and/or health and human service roles the opportunity to critically examine the meaning of life crises in a social-cultural vs. psychopathological framework and to explore principles and creative strategies that might be used in responding constructively to crises in their own lives or in their experience as health or human-service workers. *Open to upper-division students in nursing, criminal justice, and applied social science, and the health professions.*

NUR 1304 Independent Study Elective 2 QH

Offers independent work on a chosen topic under the direction of members of the college. Allows student to contract with a faculty member whose background, interests, and time allow direction of an in-depth study and to develop course objectives. *Prereq.* NUR 1201.

NUR 1400 Maternal and Child Nursing 9 QH

Focuses on applying the Roy Adaptation Model in maintaining optimal health for child-bearing and child-rearing families. Using the four modes of the model, the student examines individuals and families at selected developmental stages. Presents theoretical content in four units, with the first two focusing on adaptive behaviors and the second two examining ineffective behaviors. Gives students the opportunity to assist clients in selected maternity and child-care settings in coping with the stress and stimuli that interfere with the adaptation process. *Prereq.* NUR 1300, NUR 1301, PCL 1305, PSY 1241, PSY 1242, and junior standing.

NUR 1401 Medical-Surgical Nursing 9 QH

Focuses on the effects of episodes of acute illness on individuals, families, and community. Addresses the four modes of the Roy Adaptation Model. Emphasizes the alterations and adaptations in physiology characteristic of acute episodes of illness and the nurse's role in intervention. Also discusses the impact of illness on patterns of living, the needs for health teaching, and continuity of care. Provides guided clinical experiences, emphasizing the nursing process and the skills necessary to plan and implement care for adults in an acute-care setting. *Prereq.* NUR 1300, NUR 1301, PCL 1305, PSY 1241, PSY 1242, and junior standing.

NUR 1402 Health Assessment 4 QH

Provides the student with additional theory and skills relevant to the clinical decision-making role of the nurse as a primary caretaker. Extends the student's knowledge and experience of history-taking and physical and psychosocial assessment. Emphasizes analysis and synthesis of data obtained from a holistic health assessment as an essential framework for the identification of common health abnormalities and the enhancement of the nurse's clinical decision-making skills. *Prereq.* NUR 1300, NUR 1301, or NUR 1302. *Open to upper-division students in nursing.*

NUR 1403 The Nurse Planner and Coordinator of Nursing Care 4 QH

Focuses on the nurse as a planner and coordinator of nursing care. Examines the theoretical base for organizing and facilitating the delivery of efficient and appropriate nursing services to client/patients across various settings. Explores concepts from nursing, organizational theory, decision-making theory, and leadership and management theory to heighten the professional nurse's awareness of the complexity of human and material resources required for the delivery of nursing care to clients and the importance of collaboration with a variety of providers. *Open to upper-division students in nursing.*

NUR 1404 The Nurse Entrepreneur 4 QH

Focuses on the role of the nurse as an entrepreneur. Within the generic functions of nursing, studies situations of patient family teaching that provide the framework for introducing students to the essentials of undertaking this function as a business venture. Includes the formation of a nurse entrepreneur's venture action plan to do patient and family teaching. *Open to upper-division students in nursing.*

NUR 1500 Community Health Nursing 9 QH

Focuses on the use of the nursing process in working toward the adaptation of individuals, families, groups, and communities. Examines utilization of the Roy Adaptation Model in addressing client needs. Analyzes the interrelationship of client and environmental factors as they relate to the attainment of health goals. Discusses the influence of the role of

the community health nurse and cultural, political, socioeconomic, and epidemiological factors on client adaptation. *Prereq. NUR 1400, NUR 1401, PSY 1242, SOA 1100, and senior standing.*

NUR 1501 Contemporary Issues in Nursing 5 QH

Analyzes sociological, political, legal, economic, ethical, historical, and ideological factors affecting contemporary nursing practice and the health-care system. Synthesizes professional role issues. *Prereq. NUR 1400, NUR 1401, SOC 1100, and senior standing.*

NUR 1502 Introduction to Research in Nursing 4 QH

Builds on students' prior exposure to select studies applied to nursing. Discusses and critiques qualitative and quantitative research and the value of each to the practice of nursing and to the health-care field. Examines the importance of research in nursing to both practitioner and consumer. *Prereq. NUR 1400, NUR 1401, SOA 1100, and senior standing.*

NUR 1503 Advanced Clinical Care 4 QH

Builds on students' clinical nursing experiences. Focuses on analyzing, synthesizing, and prioritizing solutions to patients' problems, using the case study format. Applies concepts of pathophysiology, nutrition, pharmacotherapeutics, stress, and crisis to acutely ill clients in case simulations. Develops clinical nursing judgment with acutely ill patients in adult, maternal, and child populations. *Prereq. NUR 1400 and NUR 1401. Open to upper-division students in nursing.*

Criminal Justice

CJ 1101 Administration of Criminal Justice 4 QH

Surveys the contemporary criminal justice system from the initial contact with the offender through prosecution, disposition, incarceration, and release to the community. Emphasizes major systems of social control: police, corrections, juvenile justice, mental health systems, and their policies and practices relative to the offender. Maintains balanced study by providing legal, empirical, and sociological materials.

CJ 1110 Topics in History of Criminal Justice 4 QH

Provides a historic survey of the principles of criminal justice in the ancient and medieval periods, with emphasis on the impact of religion and philosophy.

CJ 1111 Topics in History of Criminal Justice 4 QH

Continues the historic survey with an examination of the effects of the Renaissance and the Reformation and the rise of nation states.

CJ 1112 Critical Issues in Criminal Justice and Criminology 4 QH

Introduces students to the major issues and ethical considerations facing criminal justice and criminology today. Discusses six to eight major critical,

moral, and ethical issues. Considers such core topics as the death penalty, abortion, euthanasia, abolition of the insanity plea, victimless crimes (prostitution, drug abuse, gambling), and gun control. Presents these issues in the format of pros and cons; involves student presentations or debates.

CJ 1151 Introduction to Law and the Legal Process I 4 QH

Provides an introduction to the law and the legal system of the United States. Sets forth the fundamentals of our legal process and provides a summary description of both the private and public law system. Presents an overview of the traditional structure, as well as the basic principles of law.

CJ 1152 Introduction to Law and the Legal Process 2 4 QH

Continues the material presented in CJ 1151. Introduces basic tort and contract principles, administrative law, and governmental regulation of business, topics of particular concern to criminal justice professionals in both the public and private sectors, as well as to those students concentrating in legal studies. *Prereq. CJ 1151 and CJ 1252.*

CJ 1201 Criminology**4 QH**

Covers patterns and evolution of criminal behavior, the social forces involved, and development of the individual criminal. Examines administration of criminal justice—law, courts, police, prisons.

CJ 1251 Introduction to Criminal Law**4 QH**

Deals with the area of criminal responsibility, some of its limitations, and certain modifications substantially affecting it. Requires an ability to express in writing both the knowledge of a particular concept and the ability to identify it in a complex fact pattern and discuss its implications and ramifications.

CJ 1252 Criminal Due Process**4 QH**

Focuses on a historical evaluation of the Fourteenth Amendment and its use in making rights prescribed under the Bill of Rights applicable to the individual states. Also details the inherent problems of the Fifth and Sixth Amendments, including the effect of their implications on such matters as police practices, illegal search and seizure, and right to counsel. Expects students to be familiar with basic concepts as well as changing interpretations so they can cite cases that may stand as precedents for conclusions they draw. *Prereq. CJ 1251.*

CJ 1253 Introduction to Criminal Courts**4 QH**

Examines the role of criminal courts in the United States, the structure and organization of the court system, and the flow of cases from arrest to conviction. Focuses on the key actors in the courtroom—prosecutors, defense attorneys, judges, and court clerks—and the decision-making processes in charging, setting bail, pleading guilty, going to trial, and sentencing. Addresses prospects for reforming courts. *Prereq. CJ 1251 and CJ 1252.*

CJ 1254 Civil Liability in Criminal Justice**4 QH**

Studies the contemporary problems of civil liability affecting the criminal justice professional. Reviews cases involving police, security, probation, parole, and corrections personnel to help students understand and appreciate the legal factors, public policy issues, and methods of reducing the risk of civil liability. *Prereq. CJ 1251, and CJ 1252.*

CJ 1301 Introduction to Security**4 QH**

Examines the organization and administration of security and loss prevention programs in industry, business, and government. Emphasizes the protection of assets, personnel, and facilities and focuses on the relations between security organizations and government agencies.

CJ 1311 White-Collar Crime**4 QH**

Gives the student a basic understanding of white-collar crime. Covers such topics as the nature and extent of white-collar crime, the social-psychologic makeup of white-collar crime, typologies, current efforts directed toward controlling it, and the inter-agency and jurisdictional problems and the benefits of cooperation.

CJ 1314 Security Management and Supervision**4 QH**

Deals with the roles and responsibilities of the security manager. Gives special attention to the respon-

sibilities of planning, organizing, staffing, directing, controlling, representing, and innovating. Explores the manager's responsibility in professionalizing security and other relevant issues. *Prereq. CJ 1301 or equiv.*

CJ 1315 Security Design and Technology**4 QH**

Acquaints students with options and applications of today's scientific and technological products. Attempts to prepare students in security planning and to develop managerial skills needed to plan security systems using the state-of-the-art technology. *Prereq. CJ 1301 or equiv.*

CJ 1318 Terrorism**4 QH**

Attempts to give the student an understanding of what terrorism is and why it has become so popular. Includes the role of news media, political consequences of terrorism, the military as a resource, and the role of the hostage.

CJ 1319 Legal Aspects of Security Management and Operations**4 QH**

Provides a comprehensive examination of the legal environment and issues affecting security operations and management. Analyzes elements of criminal, civil, property, regulatory, and business law from the perspective of organizational security management concerns. Includes legal basis of security practices, civil liability, corporate security, investigations, labor law, industrial espionage, governmental security issues, and other relevant topics.

CJ 1401 Law Enforcement Administration and Management**4 QH**

Covers the principles of police organization, administration, and management, including staff and line functions, chain of command, span of control, selection of personnel, and promotional systems. Also considers special problems such as strikes, natural and atomic disasters, narcotic traffic, and vice control.

CJ 1411 Police Operations**4 QH**

Offers a general survey of police operational procedures, including patrol, traffic, interrogations, and report writing. Uses role playing to demonstrate interviewing methods. *Prereq. CJ 1401.*

CJ 1421 Police-Community Relations**4 QH**

Covers police-public contact; uses of the communications media in projecting the police image; responsibilities of police in dealing effectively with minority groups, civil rights, civil disorder, and public protection. Explores the role and function of the police in intergroup relations. *Prereq. CJ 1401, CJ 1411, and junior or senior standing.*

CJ 1424 Seminar in Law Enforcement**4 QH**

Specific topic in law enforcement to be announced. *Prereq. CJ 1401, CJ 1411, and junior or senior standing.*

CJ 1425 Police Discretion**4 QH**

Examines the nature and impact of discretion as it relates to police decision making. Gives attention to various forms of police discretion and ways in which it can be structured, confined, and checked. Gives

students the opportunity to examine and analyze sample police department policies and to study different formal and informal methods of developing policies. Also studies the relation of discretion to controlling police behavior and police corruption. *Prereq. Middler, junior, or senior standing.*

CJ 1426 Topics in Law Enforcement 4 QH
Specific topic in law enforcement to be announced. *Prereq. Junior or senior standing.*

CJ 1427 Topics in Criminal Justice 4 QH
Specific topic in criminal justice to be announced. *Prereq. Junior or seniors standing.*

CJ 1451 Criminal Justice Research 4 QH
Surveys methods for basic and applied research in criminal justice, combining statistics and research methods. Concentrates on research application by stressing discussion of the general role of research in the discipline and specific contributions advanced by studies in the literature. *Prereq. MTH 1010 or equiv., and middler, junior, or senior standing.*

CJ 1501 Evidence I 4 QH
Provides students the opportunity to develop their understanding of the manner in which legal issues and disputes are resolved by trial. Focuses on the manner in which the trial system works and the reasoning behind the rules governing its operation, including rules of evidence: the mechanics of the adversary system, relevancy, reliability, and rules of exclusion based on policy considerations other than relevancy and reliability. Includes such learning tools as videotapes, mock trials, observation of actual court trials, lectures, take-home assignments, and exams. *Prereq. CJ 1251, CJ 1252.*

CJ 1502 Evidence 2 4 QH
Continues with reliability and rules of exclusion, based on policy considerations other than relevancy and reliability, as set forth in CJ 1501. *Prereq. CJ 1501.*

CJ 1512 Seminar in Law and Criminal Justice 4 QH
Specific topic in the law and criminal justice to be announced. *Prereq. CJ 1251, CJ 1252, and junior or senior standing.*

CJ 1513 Criminal Homicide 4 QH
Surveys the topic of homicide. Explores general murder patterns and analyzes types of homicide emphasizing mass and serial killing. Discusses criminal justice issues in apprehension, prosecution, and punishment of murder.

CJ 1601 Survey of Correctional Systems 4 QH
Offers an introduction to penology and corrections. Explores the public reaction to convicted offenders historically, while concentrating on issues and programs of contemporary corrections. *Prereq. CJ 1201.*

CJ 1612 Juvenile Justice 4 QH
Gives an overview of the institutional response to the problems of juvenile delinquency, juvenile misconduct, and dependent/neglected and abused children. Emphasizes the police, court, and correctional agencies that process young people. In addition, devotes attention to an understanding of the history of the system, recent legal developments, and an assessment of current proposals for reform. *Prereq. SOC 1100 and CJ 1201.*

CJ 1613 Probation and Parole 4 QH
Examines the nature and problems of correctional field service, both adult and juvenile. *Prereq. CJ 1601.*

CJ 1615 Crime and Criminal Justice: A Comparative View 4 QH
Examines the problems of crime and its control from the vantage point of the comparative perspective. Analyzes countries such as Soviet Russia, China, France, East Germany, and West Germany. Also analyzes Great Britain, Holland, Finland, and Sweden in terms of their incidence and type of deviance and crime, as well as in terms of approach to social control and prevention of crime. Examines points of divergence between these countries and the United States in perceived causes of crime and differing approaches to rehabilitation and crime prevention. *Prereq. CJ 1101, SOC 1100, or equiv.*

CJ 1616 Women and the Criminal Justice System 4 QH
Introduces students to issues relating to roles taken by women involved with the criminal justice system and to the system's various responses to women in these roles. Focuses on women as victims of crime, as offenders, and as practitioners. *Prereq. Middler, junior, or senior standing.*

CJ 1618 Victims of Crime 4 QH
Examines current theory and research regarding victims of crime. Devotes attention to concepts such as victim vulnerability and victim culpability. In addition, discusses the implications of a victim-oriented perspective for the administration of justice. Assesses current victim programs, including restitution, mediation, and compensation.

CJ 1801, CJ 1802, CJ 1803, CJ 1804 4 QH each
Directed Study

Military Science

AIR 1110 Air Force Today I 1 QH
Examines the role of the United States Air Force in the contemporary world. Surveys background, mission, and organization of the Air Force and functions of United States strategic forces. Also emphasizes development of written communicative skills.

AIR 1111 Leadership Laboratory I 1 QH
Introduces the customs, traditions, and courtesies of the Air Force through guest speakers, seminars, and a field trip to an Air Force base.

AIR 1120 Air Force Today 2**1 QH**

Continues study of the contemporary Air Force by examining general-purpose forces, aerospace support forces, and the total force structure.

AIR 1121 Leadership Laboratory 2**1 QH**

Continues AIR 1111, with emphasis on the role and responsibilities of an Air Force company grade officer.

AIR 1210 Development of Air Power**1 QH**

Traces the history of the development of air power from balloon experiments up through World War II. Emphasizes interrelation of technology, doctrine, and historical events. Emphasizes student participation and presentations to enhance verbal skills.

AIR 1211 Leadership Laboratory 3**1 QH**

Emphasizes development of techniques used to direct and inform. Assigns students to leadership and management positions in the AIR 1111 programs previously described.

AIR 1220 Development of Air Power**1 QH**

Traces the history of airpower since 1946, with emphasis on the United States Air Force. Includes the role of air forces in conflicts and the effect of space-age technology on air power. Also examines the employment of U.S. air power in peaceful ways.

AIR 1221 Leadership Laboratory 4**1 QH**

Continues AIR 1211. Adds a special program in preparation for field training.

AIR 1310 Management and Leadership 1**4 QH**

Examines management and leadership from the point of view of the Air Force junior officer. Covers the individual motivational and behavioral processes, leadership, communication, and group dynamics to provide a foundation for the development of the junior officer's professional skills as an Air Force officer.

AIR 1311 Leadership Laboratory 7**1 QH**

Provides supervisory practice and exercise of leadership functions in controlling and directing activities of the cadet group. Develops leadership potential in a practical, supervised training lab.

AIR 1320 Management and Leadership 2**4 QH**

Continues AIR 1310 with special emphasis on the basic managerial processes involving decision making, utilization of analytical aid in planning, organizing, and controlling in a changing environment. Discusses organizational and personal values, management of forces in change, organizational power, politics, and managerial strategy and tactics in the context of the military organization. Uses actual Air Force cases to enhance the learning and communication processes.

AIR 1321 Leadership Laboratory 8**1 QH**

Continues AIR 1311. Emphasizes supervisory and leadership skills. Discusses advantages of an Air Force career.

AIR 1410 National Security Forces 1**4 QH**

Studies the military's role as an institution in a democratic society. Includes such topics as civil-military

interaction and the military as a profession. Emphasizes developing communicative skills through student presentations.

AIR 1411 Leadership Laboratory 5**1 QH**

Focuses on exercise of management functions in planning, supervising, and directing cadet group activities. Provides opportunity to acquire proficiency in military leadership skills.

AIR 1420 United States National Security Forces 2**4 QH**

Studies the role of the military in maintaining the security of the United States. Examines the international environment, the background of defense policy, strategy, and forms of conflict. Addresses specific issues, including weapons acquisition, arms control, nuclear deterrence, and the national military decision-making process.

AIR 1421 Leadership Laboratory 6**1 QH**

Continues AIR 1411. Gives students the opportunity to prepare themselves for professional duties.

ARM 1100 Leadership Laboratory 1**0 QH**

Introduction of first-year ROTC students to the basic tenets of discipline and regimentation of the United States Army. Includes the basics of proper wear of military clothing, proper rendering of military courtesies, military customs and traditions, individual and group drill and ceremonies, manual of arms for the M16A1 rifle, and physical fitness training.

ARM 1101 Introduction to Organizational Structure**1.5 QH**

Uses the United States Army to introduce the beginning management student to the nature of organizations. Discusses types of organizational structures, the principles of organizational development, organizational evolution, vertical and horizontal growth and mobility, organizational leadership, and the role of the entry-level manager within the organization. Focuses on the need for lower-level managers to be technically competent and skilled in various aspects of human resource management to satisfy the needs of the organization as well as to prosper personally.

ARM 1102 Leadership vs. Management Styles**1.5 QH**

Teaches leadership and management concepts. Illustrates particular management skills: problem analysis and decision-making, planning and organizing, delegation and control, and interpersonal skills. Uses realistic management simulations and structured exercises to teach essential leadership skills.

ARM 1103 Winning Strategies for Small Organizations**1.5 QH**

Assists students, regardless of their fields of study, in developing winning strategies through the practical application of proven management, time allocation, and planning sequence techniques specifically designed for small organizations. Introduces students to management by objective as a technique to facilitate the focusing of critical resources at the time and place most needed. Also discusses how the small organization's structure and leadership hierarchy affects goal outcome.

ARM 1200 Leadership Laboratory 2**0 QH**

Presents introduction and hands-on training for second-year ROTC cadets. Includes required basic military skills, including nuclear, biological, and chemical protective training; selected weapons training; use of United States Army communications equipment; land navigation; orienteering; rappelling; and limited military vehicle maintenance training.

ARM 1201 Basic Rifle Marksmanship**1 QH**

Provides instruction and practical application in basic rifle marksmanship techniques, safety, and range operations.

ARM 1202 Comparative Armies**1.5 QH**

Presents an introduction to the roles and organization of the United States Army's Active, Reserve, and National Guard. Utilizing these concepts as building blocks, examines and compares armies currently affecting United States doctrine and tactics. Integrates the Soviet, Warsaw Pact, NATO, and other world forces into the course structure through the study and examination of current events inside and outside the military establishment.

ARM 1203 Military First Aid**1.5 QH**

Introduces the fundamentals of military first aid. Includes evaluation of a casualty, mouth-to-mouth resuscitation, cardiopulmonary resuscitation, first aid for burns, and appropriate temperature prevention program.

ARM 1300 Leadership Laboratory 3**0 QH**

Provides advanced leadership applications for the middler-year Army ROTC cadets. Includes the review and hands-on training of all basic military skills learned in the ROTC basic program of instruction. Gives middler cadets increased leadership responsibility within the cadet battalion for further development and evaluation as well as preparation for their junior year Camp All American platoon training.

ARM 1301 Land Navigation**2 QH**

Gives students the opportunity to learn how to identify map symbols to natural and manmade features; identify/use military grid reference system; measure straight line and read distance on a map; measure and plot an azimuth; convert azimuth from grid to magnetic grid; grid; locate an unknown point using polar coordinates; locate an unknown point using intersection; locate an unknown point using resection; determine the evaluation of a specific point on the map; inspect a compass for accuracy; navigate from one point on the ground to another. *Prereq. Basic course completion.*

ARM 1302 Advanced Tactical Planning**2 QH**

Introduces the fundamentals of offensive and defensive combat at the squad and platoon levels. Includes unit organizations and capabilities, tactical planning, combat orders. Utilizes practical exercises placing the student in leadership roles in simulated tactical environments. Additionally, examines the proper method to conduct briefings, provide training input, and prepare, conduct, and evaluate training. *Prereq. Basic course completion.*

ARM 1303 Advanced Leadership Clinic**2 QH**

Provides classroom, programmed instruction, and practical exercises (for example, land navigation, physical conditioning, weapons familiarization, and leadership) designed to prepare cadets for maximum individual performance at the six-week ROTC advanced camp. Required for all cadets attending advanced summer camp at Fort Bragg, North Carolina. *Prereq. Basic course completion.*

ARM 1305 Advanced Leadership Laboratory 5**6 QH**

Provides external leadership lab conducted at Fort Bragg, North Carolina, during the summer quarter. As an intensive six-week course, includes application of leadership principles in positions at varying levels of responsibility. Also includes supplemental instruction such as physical conditioning, counseling, senior-subordinate relations, tactical doctrine, international laws of land warfare, and approaches to problem solving. Course attended by students from 123 colleges and universities from Maine to Florida. All expenses borne by the United States government, including a stipend of approximately five hundred dollars.

ARM 1400 Leadership Laboratory 4**0 QH**

Gives fourth-year ROTC cadets practical application of previously learned skills, techniques, education, and experience by assisting ROTC cadre in the conduct of ARM 1100, ARM 1200, and ARM 1300. Gives cadets an opportunity to prepare and present instruction, manage constrained resources, and supervise subordinates. Evaluates cadets based on active-duty Army criteria. Requires attendance by all fourth-year ROTC cadets enrolled in an ROTC course.

ARM 1401 Organization and Communications Skills**2 QH**

Examines the theory, methods, and principles for understanding and motivating human behavior in organizations. Emphasizes the principles and dynamics of leadership. Directs those principles toward the development of leadership styles. Introduces the officer and noncommissioned officer evaluation system. Makes practical applications through the use of case studies and group processes. *Prereq. Basic course completion.*

ARM 1402 Military Law and Ethics**2 QH**

Examines the issues and responsibilities imposed by law on commanders and staff officers in two broad areas: the military criminal justice system and military administrative law. Presents in-depth analysis of the responsibilities and duties of officers and non-commissioned officers operating in the military justice system. Focuses on the legal basis for command and on administrative due process, judicial review of military activities, and other topical issues. Gives students the opportunity to address and develop an understanding of the need for ethical conduct, and an awareness and sensitivity to ethical issues. *Prereq. Basic course completion.*

ARM 1403 Leadership Seminar and Ethics**2 QH**

Provides senior ROTC cadets with need-to-know information that facilitates their entry into active

duty. Also provides a forum for the study of personnel, training, logistical, and installation support systems. Discusses personal finances as well as the officer and noncommissioned officer evaluation systems. Gives students the opportunity to address and develop an understanding of the professional ethics of officership, including the need for ethical conduct, and an awareness of and sensitivity to ethical issues. *Prereq.* Basic course completion.

NAV 1100 Naval Science Laboratory 0 QH

Focuses on either drill instruction or practical work to complement classroom instruction. Must be taken in each class quarter by all NROTC students.

NAV 1101 Introduction to Naval Science 3 QH

Presents a general introduction to the naval profession and the concepts of seapower. Emphasizes the mission, organization, and warfare components of the United States Navy and Marine Corps. Includes an overview of officer and enlisted ranks and rates, training and education, and career patterns. Also covers naval courtesy and customs, military justice, leadership, and nomenclature. Exposes the student to the professional competencies required to become a naval officer.

NAV 1102 Naval Ships Systems 1 4 QH

Studies in detail ship characteristics and types, including ship design, hydrodynamic forces, stability, compartmentation, propulsion, electrical and auxiliary systems, interior communications, ship control, and damage control. Includes basic concepts of the theory and design of steam, gas turbine, and nuclear propulsion. Also discusses shipboard safety and firefighting.

NAV 1201 Naval Ships Systems 2 4 QH

Outlines the theory and employment of weapons systems. Explores the processes of detection, evaluation, threat analysis, weapon selection, delivery, guidance, and explosives. Discusses fire control systems and major weapons types, including capabilities and limitations. Describes the physical aspects of radar and underwater sound in detail. Explores the facets of command, control, and communications as a means of weapons system integration.

NAV 1202 Seapower and Maritime Affairs 3 QH

Surveys United States naval history from the American Revolution to the present with emphasis on major developments. Includes an in-depth discussion of the geopolitical theory of Mahan. Also treats present-day concerns in seapower and maritime affairs, including the economic and political issues of merchant marine commerce, the law of the sea, the Russian navy and merchant marine, and a comparison of United States and Soviet naval strengths.

NAV 1301 Navigation and Naval Operations 1 4 QH

Studies piloting and celestial navigation, including theory, principles, and procedures. Focuses on piloting navigation, including the use of charts, visual and electronic aids, and the theory and operation of magnetic and gyro compasses. Covers celestial

navigation in depth, including the celestial coordinate system, an introduction to spherical trigonometry, the theory and operation of the sextant, and a step-by-step treatment of the sight reduction process. Gives students the opportunity to develop practical skills in both piloting and celestial navigation. Discusses other topics such as tides, currents, effects of wind and weather, plotting, use of navigation instruments, types and characteristics of electronic navigation systems, and the day's work in navigation.

NAV 1302 Navigation and Naval Operations 2 4 QH

Studies the international and island rules of the nautical road, relative-motion vector-analysis theory, relative motion problems, formation tactics, and ship employment. Also includes an introduction to naval operations and operations analysis, ship behavior and characteristics in maneuvering, applied aspects of ship handling, and afloat communications.

NAV 1310 Evolution of Warfare 4 QH

Traces the development of warfare from the dawn of recorded history to the present, focusing on the impact of major military theorists, strategists, tacticians, and technological developments. Gives the student the opportunity to acquire a basic sense of strategy, to develop an understanding of military alternatives, and to see the impact of historical precedent on military thought and action.

NAV 1401 Leadership and Management 1 3 QH

Studies at an advanced level organizational behavior and management in the context of the naval organization. Includes such topics as the management functions of planning, organizing, and controlling; individual and group behavior in organizations; and motivation and leadership. Explores major behavioral theories in detail. Investigates practical applications by the use of experiential exercises, case studies, and lab discussions. Develops other topics, including decision making, communication, responsibility, authority, and accountability.

NAV 1402 Leadership and Management 2 3 QH

Studies naval junior officer responsibilities in naval administration. Exposes the student to a study of counseling methods, military justice administration, naval human resources management, directives and correspondence, naval personnel administration, material management and maintenance, and supply systems. As the capstone course in the NROTC curriculum, builds on and integrates the professional competencies developed in prior course work and professional training.

NAV 1410 Amphibious Warfare 4 QH

Surveys the historical development of amphibious doctrine and the conduct of amphibious operations. Emphasizes the evolution of amphibious warfare in the twentieth century, especially during World War II. Explores present-day potential and limitations on amphibious operations, including the rapid deployment force concept.

Cooperative Education

COP 1135 Professional Development for Journalists 1 QH

Provides current career information in the field of journalism. Prepares journalism students for the cooperative education experience as well as introducing them to the academic preparation necessary to pursue a successful career in the journalist profession. Focuses on effective resume writing, letters of application, and interviewing techniques specifically geared to those who intend to pursue a career in journalism.

COP 1180 Career Decision-Making 4 QH

Focuses on needs and concerns of students who may be undecided or uncertain about their academic major or career direction. Addresses the needs of the group, as well as individual participants, and emphasizes self-assessment, career exploration, decision making, and goal setting. *Prereq.* Freshmen or sophomores in any major or permission of instructor.

COP 1220 Working in the United States 4 QH

As a career development course for international students in their first-through-third years, helps students compete more effectively for cooperative edu-

cation positions in the United States and assists them in their cultural transition into the American work force. Considers work-oriented cross-cultural issues, the American work ethic, skills development, resume writing, and interviewing techniques. *Prereq.* International students only.

COP 1314 Life/Career Planning 4 QH

Focuses on career exploration, self-assessment, job-search techniques, and networking. Requires students to prepare a professional resume, to participate in videotaped mock interviews, to research careers, and to investigate graduate and professional schools. *Prereq.* Junior or senior in any major standing or permission of instructor.

COP 1353 Professional Development for Education 1 QH

Examines career management issues for fourth-year students. Discusses work and personal values, current issues in the employment market, planning for graduate study, organizing and conducting a job search, advanced resume preparation, and interviewing techniques.

Alternative Freshman-Year Program

The following courses will be offered in the Alternative Freshman-Year Program during the 1990–1991 academic year.

ECN 4601 Economics I 4 QH

Examines development of macroeconomic analysis, national income concepts, national income determination fluctuation and growth, role of the banking system and the Federal Reserve System, government expenditures and taxation, international trade, and balance of international payments.

ED 4001 Integrated Language Skills Development I 2 QH

Strives to improve a student's reading comprehension and related study and language skills. Devotes time, discussion, and considerable practice to meaning skills such as basic reading comprehension and interpretation, including work in critical reading and other interpretational acts (inferences, understanding imagery, and symbolic usage). Focuses on study skills, previewing, finding main ideas and details, outlining and summarizing, continuous interaction, and interaction of all the communications skills—reading, writing, listening, and speaking.

ED 4002 Integrated Language Skills Development 2 2 QH

Continues discussion of topics introduced in ED 4001. *Prereq.* ED 4001.

ED 4003 Integrated Language Skills A 4 QH

Strives to improve a student's reading comprehension and related study and language skills. Devotes

time, discussion, and considerable practice to meaning skills such as basic reading comprehension and interpretation, including work in critical reading and other interpretational acts (inferences, understanding imagery, and symbolic usage). Focuses on study skills, previewing, finding main ideas and details, outlining and summarizing, continuous interaction, and interaction of all the communications skills—reading, writing, listening, and speaking.

ED 4004 Integrated Language Skills B 4 QH

Extends ED 4003, with continued emphasis on study skills, including researching, organizing, and writing term papers. Explores critical thinking as it relates to the learning process. Also addresses the choices of academic major and career direction, emphasizing self-assessment and personal decision making. *Prereq.* ED 4003.

ENG 4013 Fundamentals of English I 4 QH

Presents an intensive introduction to the principles of effective expository writing. Emphasizes description, paragraph construction, and organization. Reviews English usage, punctuation, and syntax. Includes essay assignments.

ENG 4014 Fundamentals of English 2 4 QH

Presents intensive instruction in exposition, argument, and academic essay writing and includes

instruction in the writing of a research paper. Continues emphasis on English usage, punctuation, and syntax. Includes essay assignments.

HST 4110 History of Civilization A **4 QH**
Covers the major ideas and institutions of civilization from ancient times to 1648.

HST 4111 History of Civilization B **4 QH**
Continues HST 4110, covering the period since 1648.

MGT 4110 Survey of Business and Management **4 QH**
Offers an introduction to the setting and general structure of American business, the characteristics of private enterprise, and the nature and challenge of capitalism and other forms of economic enterprise. Discusses the forms of business, the structure of organization, and the functions of management in the context of their influence on the various forms of business. Through lecture and class discussion, the student gives an overview of the methodologies used in planning, organizing, directing, and controlling the functions of production, marketing, sales, pricing, and finance.

MTH 1000 Mathematical Preliminaries 1 **4 QH**
Reviews precollege mathematics, primarily arithmetic. Covers operations with numbers, fractions, decimals, percents, and graphs (pictographs, bar graphs, circle graphs, etc.), together with applications of these skills and concepts.

MTH 1010 Mathematical Preliminaries 2 **4 QH**
Surveys precollege algebra, including signed numbers, exponents, multiplication of polynomials, fac-

toring, linear equations, graphing, and radicals. For students whose background in algebra is weak.

MTH 1113 College Mathematics for Business **4 QH**
Examines sets, rectangular coordinates and graphs, functions and functional notation, linear and quadratic functions, exponential and logarithmic functions, systems of linear equations, summations, inequalities, permutations and combinations, elementary probability concepts, arithmetic and geometric progressions, simple and compound interest, and annuities.

POL 4106 Introduction to Politics **4 QH**
Studies the basic political concepts and forces of organization from the classical Greeks to the modern nation-state. Contrasts the Soviet Union and the United Kingdom as contemporary illustrations of the institutional distinction between a totalitarian and a constitutional system.

SOC 4010 Principles of Sociology 1 **4 QH**
Introduces basic concepts and theories relating to the study of humans as participants in group life. Emphasizes socialization, culture, social structure, primary groups, family, social stratification, and population.

SOC 4011 Principles of Sociology 2 **4 QH**
Continues SOC 4010. Emphasizes critical analysis of American society, with attention to problems of social, political, urban, and industrial change.

Appendix

Academic Calendar 1990–1991

September 1990

3	Monday	Labor Day. University closed.
4–7	Tuesday–Friday	Final examinations for Basic Colleges.
10–19	Monday–Wednesday	Division B vacation.
13	Thursday	Fall commencement.
17	Monday	Freshman and transfer students orientation and University registration.
20	Thursday	Upperclass registration (Division B) 9 AM.
19–21	Wednesday–Friday	Continuation of course advising, course registration, course drop/add periods, and orientation for college day programs.
24	Monday	Classes begin in Basic Colleges for fall quarter at 8 AM.

October 1990

8	Monday	Columbus Day. University closed.
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November 1990

12	Monday	Veterans Day. University closed.
22–24	Thursday–Saturday	Thanksgiving Day recess.

December 1990

10–14	Monday–Friday	Final examinations for Basic Colleges.
17–31	Monday–Monday	Christmas vacation.

January 1991

1	Tuesday	New Year's Day. University closed.
2	Wednesday	Orientation and registration for new freshmen and transfers; registration for continuing September freshmen and returning upperclass students (Division A)
3	Thursday	Registration, orientation, and course drop/add continues until noon.
4	Friday	Classes begin in Basic Colleges for winter quarter at 8 AM.
21	Monday	Martin Luther King, Jr.'s Birthday observed. University closed.

February 1991

18	Monday	Presidents Day. University closed.
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March 1991

18-22	Monday-Friday	Final examinations for Basic Colleges.
25-30	Monday-Saturday	Division A vacation.

April 1991

1	Monday	Orientation and registration for transfer students, continuing freshmen, and returning upperclass students.
2	Tuesday	Registration, orientation, and course drop/add continues until noon.
3	Wednesday	Classes begin in Basic Colleges for spring quarter at 8 AM.
15	Monday	Patriots Day. University closed.

May 1991

27	Monday	Memorial Day. University closed.
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June 1991

10-14	Monday-Friday	Final examinations for Basic Colleges.
15	Saturday	Commencement.
17-21	Monday-Friday	Division B vacation.
24	Monday	Registration for Division A and D and January freshmen (Quarter 3). Beginning of summer quarter.
25	Tuesday	Basic College classes begin at 8 AM.

July 1991

4	Thursday	Independence Day. University closed.
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September 1991

2	Monday	Labor Day. University closed.
3-6	Tuesday-Friday	Final examinations for Basic Colleges.
9-18	Monday-Wednesday	Division A vacation.
12	Thursday	Fall commencement.
16	Monday	Beginning of 1991-1992 academic year. Orientation week for new students. Registration and advising week for all returning upperclass students and all new students.
23	Monday	Classes begin for Basic Colleges for fall quarter at 8 AM.

Calendar dates are subject to change. The University community will be notified if such changes are necessary.

University Registrations

Winter 1991	January 2	Tuesday
Spring 1991	April 1	Monday
Summer 1991	June 24	Monday
Fall 1991		
New students	September 16	Monday
Upperclass	September 19	Thursday

Course Registrations: Thursdays, 7:30 AM, Ell Ballroom

Winter 1991	October 25	Course registration 2
Spring 1991	November 8	Course registration 1
	January 24	Course registration 2
Summer 1991	February 14	Course registration 1
	April 18	Course registration 2
Fall 1991	May 9	Course registration 1
	July 25	Course registration 2

Course Registrations: Drop/Add

Winter 1991	November 13, 14
	December 10, 11, 12
Spring 1991	November 26, 27
	February 13
	March 20, 21, 22
Summer 1991	March 6, 8
	May 8, 10
	June 12, 13, 14
Fall 1991	May 28, 29
	September 4, 5, 6

Grades Deadline: All Grades Mailed the Following Day

Winter 1991	March 26
Spring 1991	June 18
Summer 1991	September 10
Fall 1991	December 16

Mission Statement

Northeastern University's mission, as a large urban university founded on the cooperative model of education, is to provide individuals with the opportunity for upward mobility through excellence in education. The University achieves its mission through curricula that value equally knowledge for its own sake, knowledge as a means to success in the workplace, and knowledge as a cornerstone of personal achievement and satisfaction.

Achieving Northeastern University's mission requires excellence in teaching, and teaching remains the central activity of Northeastern's faculty. By offering undergraduate and graduate programs that are rigorous, relevant, and rewarding, the University provides a solid structure for educational excellence. Northeastern University is also committed to the search for knowledge through the scholarly and artistic undertakings of its faculty and students.

A central mandate of Northeastern University is to offer students the opportunity to apply directly lessons of the classroom and laboratory to the workplace through cooperative education. For three quarters of a century, cooperative education has been the keystone of Northeastern's uniqueness. As an increasing percentage of the nation's population enters the workforce, and new technologies continue to change the nature of work, the University has re-dedicated itself to helping the cooperative plan keep pace with those changes.

Northeastern University is committed to serving the educational needs of a diverse student population in an amenable physical environment. The University believes that its mission can be achieved only if the student body is not limited by economic status, cultural or racial background, geographic origin, sex, or age. Northeastern has a long history of serving the educational needs of the nontraditional student, providing degree and nondegree programs for people whose circumstances prevent them from following the standard college regimen.

Looking beyond the confines of the campus, Northeastern University is determined to maintain and strengthen its reputation as a friend to the City of Boston and a partner of the Commonwealth of Massachusetts. The University's obligation to serve the community of which it is an integral part is fulfilled primarily through the educational enterprise. Through its numerous outreach programs, the University has made striking contributions to the community in the applied social sciences, in high technology, and in the arts. Northeastern University will continue to contribute in these and other ways to the region's overall quality of life and to its economic vitality.

Antidiscrimination Policy

Northeastern University is committed to a policy of equal opportunity for all students and employees without regard to race, color, religion, sex, sexual preference, national origin, or handicap, marital, or

veteran status. The University prohibits discrimination in all matters involving admission, registration, and all official relationships with students, including evaluation of academic performance.

Equal Opportunity Employment Policy

Northeastern University is an equal opportunity employer. It is institutional policy that there shall be no discrimination against any employee or applicant for employment because of race, color, religion, sex, age, sexual preference, national origin, or handicap, marital, or veteran status. Northeastern also prohibits discrimination against any employee regarding upgrading, demotion or transfer, layoff or termination, rates of pay or other forms of compensation, and selection for training. In addition, Northeastern adheres to Affirmative Action guidelines in all recruitment endeavors.

Further, Northeastern will not condone any forms of sexual harassment, which is defined as the use of unwelcome sexual advances, requests for favors, and other verbal or physical conduct of a sexual nature, as an explicit or implicit condition of employment, as the basis for employment decisions, or to interfere with an individual's work performance by creating an intimidating, hostile, or offensive work environment.

Inquiries concerning our equal opportunity policies may be referred to the University Title IX Coordinator/Compliance Officer for Section 504 of the Rehabilitation Act of 1973, Affirmative Action Office, Richards Hall. Telephone: 617-437-2133.

Accreditation Statement

Northeastern University is accredited by the New England Association of Schools and Colleges, Inc., which accredits schools and colleges in the six New England states. Accreditation by the Association indicates that the institution has been carefully evaluated and found to meet standards agreed upon by qualified educators.

Children's Center

Northeastern University operates a Children's Center in 123 Forsyth Building. The center is academically housed in the Boston-Bouvé College of Human Development Professions' Department of Curriculum and Instruction. Children from age 2 years and 9 months to 6 years are eligible. For further information, phone 617-437-3929.

Delivery of Services

The University assumes no liability, and hereby expressly negates the same, for failure to provide or delay in providing educational or related services or facilities or for any other failure or delay in performance arising out of or due to causes beyond the reasonable control of the University, which causes include, without limitation, power failure, fire, strikes by University employees or others, damage by the elements and acts of public authorities. The University will, however, exert reasonable efforts, when in its judgment it is appropriate to do so, to

provide comparable or substantially equivalent services, facilities or performance, but its inability or failure to do so shall not subject it to liability.

The Northeastern University catalog contains current information regarding the University calendar, admissions, degree requirements, fees, and regulations. Such information is not intended to be and should not be relied upon as a statement of the University's contractual undertakings.

Northeastern University reserves the right in its sole judgment to promulgate and change rules and regulations and to make changes of any nature in its program, calendar, admissions policies, procedures and standards, degree requirements, fees, and academic schedule whenever it is deemed necessary or desirable, including, without limitation, changes in course content, the rescheduling of classes, cancelling of scheduled classes and other academic activities, and requiring or affording alternatives for scheduled classes or other academic activities, in any such case giving such notice as is reasonably practicable under the circumstances.

Northeastern will do its best to make available to you the finest education, the most stimulating atmosphere, and the most congenial conditions it can provide. But the quality and rate of progress of your academic career are in large measure dependent upon your own abilities, commitment, and effort. This is equally true with respect to professional advancement upon completion of the degree or program in which you are enrolled. The University cannot guarantee that you will obtain or succeed at any particular job; that will depend upon your own skills, achievement, presentation, and other factors such as market conditions at that time. Similarly, in many professions and occupations there are increasing requirements imposed by federal and state statutes and regulatory agencies for certification or entry into a particular field. These may change during the period of time when you are at Northeastern and they may vary from state to state and from country to country. While the University stands ready to help you find out about these requirements and changes, it is your responsibility to initiate the inquiry because the University has no other way of knowing what your expectations and understandings are. In brief, the University is there to offer you educational opportunities and choices and to assist you in finding the

direction in which you want to steer your educational experience, but you are a partner in this venture with an obligation and responsibility to yourself.

Insufficient Enrollment Disclaimer

Northeastern reserves the right to cancel any course if minimum enrollments are not met.

Emergency Closing of the University

Northeastern University has made arrangements to notify students, faculty, and staff by radio when it becomes necessary to cancel classes because of extremely inclement weather. AM radio stations WBZ (1030), WEEI (590), WHDH (850), and WRKO (680) and FM stations WBCN (104.1) and WROR (98.5) are authorized to announce the University's decision to close. Since instructional television courses originate from live or broadcast facilities at the University, neither the classes nor the courier service operate when the University is closed.

Office of Services for the Handicapped

The Office of Services for the Handicapped (OSH) provides a variety of support services and general assistance to all of Northeastern's disabled students and employees. The University's efforts to comply with section 504 of the Rehabilitation Act of 1973 are coordinated by Ruth Bork, OSH director, 5 Ell Center, 617-437-2675 (TTY number is 437-2730).

Family Educational Rights and Privacy Act

In accordance with the Family Educational Rights and Privacy Act of 1974, Northeastern University permits its students to inspect their records wherever appropriate and to challenge specific parts of them when they feel it is necessary to do so. Specific details of the law as it applies to Northeastern are printed in the Student Handbook and are distributed annually at registrations of the University College and graduate schools.

Northeastern University charges tuition for all courses taken above the normal academic load. Tuition rates, all fees, rules and regulations, courses and course content are subject to revision by the President and the Board of Trustees at any time.

Northeastern
University Publications
02.90.03



Jesse Owens

Alexander Graham Bell

Jane Addams

Rosa Parks

Benjamin Franklin

George Washington

Geraldine Ferraro

Charlie Chaplin

Leonardo da Vinci

Amelia Earhart

Simone de Beauvoir

Albert Einstein

Neil Armstrong

Marian Anderson

Sandra Day O'Connor

Edgar Allan Poe

Mahatma Ghandi

Florence Nightingale

Martin Luther King

James Joyce

Immanuel Kant

Susan B. Anthony

Jane Austen

e.e. cummings

Sally Ride

Harriet Tubman

George Eliot

Edmund Hillary



1990-1991

Graduate
SCHOOLS
COURSE DESCRIPTIONS

 **Northeastern University**

Northeastern University
Graduate Schools
Course Descriptions
1990 -1991

The great work needs not only the flash, the inspiration, the peak experience; it also needs hard work, long training . . . succeeding upon the spontaneous is the deliberate; succeeding upon total acceptance comes criticism; succeeding upon intuition comes rigorous thought.

--Abraham Maslow

The truly important lessons prepare you for a lifetime of learning. During the undergraduate years, for example, you became adept at converting your curiosity into a powerful and focused motivational force. You developed a talent for combining your appetite for information with an ability to interpret facts through critical thinking.

As a graduate student at Northeastern University, you are challenged to reach beyond the ability to question and understand an existing body of knowledge--you will be asked to contribute new ideas--and that takes innovation.

An innovative spirit generates new ideas, methods, and technology: Marshaling that spirit, finding ways to introduce it in various situations, is what makes graduate studies so compelling. Beyond mastering your chosen academic discipline, learning to approach all tasks with critical thought and innovation will prove to be the lesson of value.

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Graduate School of Arts and Sciences

Anthropology and Sociology

All courses carry three quarter-hours of credit unless otherwise specified.

Social Anthropology

Many undergraduate courses in the SOA 300 and SOA 400 series may be offered for graduate credit. Students should check the current course announcements to take advantage of these offerings.

SOA 3100 Culture Theory

4 QH

Analyzes the emergence and growth of the major theoretical orientations in contemporary anthropology: functionalism, structuralism, Marxism, and post-structuralism. Examines each theory through primary sources written by anthropologists working in the various traditions. Discusses theories as they relate to the practice of anthropology and to the social context of the anthropologists' own culture.

SOA 3102 Class and State Formation

4 QH

Compares the development of social, political, and economic stratification in some societies and the maintenance of unstratified relations in others. Critically evaluates theories about why and under what conditions societies become stratified. Examines the emergence of classes and state structures in historical and contemporary cases.

SOA 3120 Camera on Culture: Visual Anthropology

Explores how cultures are portrayed on film and examines anthropologists' use of film to gather information and represent other peoples. Discusses how postcolonial societies' filmmakers have addressed their own cultures, the experience of colonialism, and the nature of filmmaking and film/video consumption in the third world. When possible, includes lab film production.

SOA 3121, SOA 3122 Fieldwork 1, 2

4 QH each

Studies data collection through participant observation and related anthropological methods. Includes data analysis and reports. *Not offered in years in which SOC 3120 and SOC 3121 are offered.*

SOA 3145 Peasants

Examines the institutions of peasant society. Investigates the structure of traditional civilizations and the relations between urban and local communities: comparative and functional analysis of the peasant community and the dynamics of change from peasant to postpeasant and industrialized societies.

SOA 3155 Individual and Culture

Examines current theory and method in the study of the interplay between personality and culture. Discusses contributions by various disciplines.

SOA 3156 Gender, Kinship, and Social Change

4 QH

Focuses on debates surrounding the origin of the gender division of labor and the family. Examines gender relations and kinship dynamics, including family forms, in a political and economic context, using examples of egalitarian, ranked, stratified, and state-level societies. Analyzes social stratification, colonial-

ism, and capitalist development in relation to changing gender roles, and critically evaluates theories of the emergence of gender hierarchy.

SOA 3220 Culture and Mental Illness

Discusses and analyzes the nature and meaning of culture, the role of culture in personality formation, culture and anxiety, and anthropological approaches to the normal and the "abnormal." Explores the question, "Is mental illness psychological fact or cultural fiction?"

SOA 3310 Development and Decolonization

Examines the transformation of postcolonial societies through capitalist or socialist development and discusses theories of modernization, neocolonialism, and uneven development. Also explores the commercialization of agriculture, urbanization, labor migration, and economic stratification as these shape and are shaped by cultural factors.

SOA 3345 Urban Ethnography

Studies selected problems in anthropological studies of urban life, analyzing class and race dimensions of those who study and those who are studied through contemporary ethnographies. Compares studies of urban life in the United States and in the neocolonial world for underlying assumptions and for characterizations of kinship, economic, and political relations. Addresses the question of domestic fieldwork or studying one's own culture.

SOA 3355 Anthropology of Law and Conflict

Topics include settling disputes in stateless societies; forms and mechanisms of social control; law as an indicator of cultural and social norms; and the study of conflict resolution as an ethnographic tool. Requires some field research and analysis.

SOA 3360 Economic Anthropology

Focuses on debates about the nature of production, distribution, and exchange in precapitalist (egalitarian and peasant) societies. Analyzes transformations of indigenous property relations, savings and credit arrangements with capitalist colonialism and postcolonial development, and examines the uneven transition from subsistence to market economies.

SOA 3410, SOA 3411, SOA 3412, SOA 3413 Contemporary Issues in Social Anthropology

3 QH each

Studies contemporary issues in the field of anthropology. Includes supervised readings and written reports on special programs.

SOA 3425 Tribal Societies and Culture

Examines the problems faced by today's tribal peoples and national minorities. Using cross-cultural case studies, students analyze the relationship of governmental policies and economic development priorities to the survival of self-identified tribal cultures and

minority populations throughout the world. Addresses questions of human rights, nationalism, cultural autonomy and resistance, and self-determination.

SOA 3440 Latin American Society and Development

Explores the process of social, economic, and cultural change in Latin America. Focusing on the present, traces class formation, agrarian structures, ethnic identity, ceremonial organization, gender roles, and political conflict since the colonial era in a range of Latin American countries. Stresses the relationship between communities and national political and economic systems. Focus over the years will alternate between Central America and Mexico and South America.

SOA 3441, SOA 3442, SOA 3443, SOA 3444, SOA 3445 Ethnographic Studies 3 QH each

These area studies courses are offered as the department's resources permit. Topics include Latin America, the Caribbean, Africa, China/East Asia, India/South Asia, Southeast Asia, the Mediterranean, and Eastern Europe.

SOA 3600, SOA 3601, SOA 3602 Seminar 3 QH each

Discusses selected topics in the field of anthropology.

SOA 3798 Master's Paper Continuation 0 QH

SOA 3800, SOA 3801, SOA 3802 3 QH each

Directed Study in Social Anthropology
Comprises reading and empirical research in social and cultural anthropology supervised by members of the anthropological staff.

SOA 3803 Directed Study in Anthropological Theory 4 QH

Studies major contemporary orientations, including evolutionary approaches, culture area, cultural ecology, functionalism, structuralism, and analysis of current status of these and other theories. *Prereq.* *Permission of Committee on Graduate Studies.*

SOA 3810 Master's Paper in Social Anthropology 3 QH

Comprises empirical or library research meeting the criteria for publication in a professional journal. *Supervised by members of the department.*

Sociology

Many undergraduate courses in the SOC 300 and SOC 400 series may be offered for graduate credit. Students should check the current course announcements to take advantage of these offerings.

SOC 3100 Foundations of Social Theory 1 4 QH

Studies the classic theorists including Durkheim, Weber, Marx, and others.

SOC 3101 Foundations of Social Theory 2 4 QH

Analyzes modern theorists from the 1930s onward (Parsons, Merton, Levi-Strauss, Goffman, Homans, Schutz, Garfinkel, Ricoeur, Lukacs, Habermas, and others). Stresses the social and historical context of theory construction.

SOC 3103 American Society

Studies the development of, and the changes in, the institutional structure of American society in comparison with certain other social systems.

SOC 3113 Introduction to Research Methods 2 QH

Introduces methods of social research including field study and participant observation techniques, survey techniques, interviewing and questionnaire construction, sampling procedures, experimental design, content analysis, and uses of available data. *Open only to Law, Policy, and Society students.*

SOC 3114 Introduction to Quantitative Research Methods 2 QH

Introduces quantitative techniques of analysis. Students are expected to conduct individual research projects. *Prereq.* *SOC 3113 or equiv.* *Open only to Law, Policy, and Society students.*

SOC 3115 Statistical Methods for Sociologists 4 QH

Introduces statistical methods relevant to sociology. Topics include tabular analysis, nonparametric statistics, analysis of variance, regression analysis, path analysis, measures of association, estimation and univariate and multivariate hypothesis testing. A knowledge of elementary statistical theory is presumed.

SOC 3116 Introduction to Research Methods 4 QH

Surveys methods of social research including field study and participant observation techniques, survey techniques, interviewing and questionnaire construction, sampling procedures, experimental design, content analysis, and use of available data.

SOC 3117 Quantitative Research Methods 4 QH

Presents quantitative techniques of analysis. Students are expected to conduct individual research projects. *Prereq.* *SOC 3116 or equiv. or permission of instructor.*

SOC 3120, SOC 3121 Seminar in Qualitative Analysis 1, 2 4 QH each

Studies qualitative techniques of analysis. Examines social-structure process and meaning in interacting groups. Students study a face-to-face group by means of participant observation using symbolic interaction concepts. *Not offered in years in which SOA 3121 and SOA 3122 are offered.*

SOC 3125, SOC 3126, SOC 3127 1 QH each

Proseminar
Focuses on issues related to graduate student life and expectations, professional and career choices, and works in progress. Students have an opportunity to explore more informally, with each other and with various faculty members, some of the important issues in the profession. *Suggested for entering students.*

SOC 3135 Issues in Social Psychology

Examines human behavior and theories of self from a sociological and psychological perspective. Gives special consideration to interpersonal relations, socialization, and symbolic interaction.

SOC 3140 Sociology of Prejudice and Discrimination

Studies the characteristics, causes, and consequences of prejudice and discrimination, with particular reference to American society.

SOC 3147 Urban Sociology

Discusses theories of the development of urban life. Compares preindustrial and industrialized urban areas. Presents methods for the study of urban social structure and change, and evaluates contemporary metropolitan action programs.

SOC 3148 Boston Seminar

Studies urban development, including environmental and historical circumstances, demands for services, response to events, and programs. Examines basis for value systems of Yankees, ethnics, and cosmopolitans, the impact on downtown and neighborhood relations, and metropolitan prospects.

SOC 3149 Metropolitan and Regional Issues

Analyzes problems, policies, programs, and activities associated with metropolitan and regional life. Includes assessment of values, institutions, networks, interest groups, decision making, service delivery, growth and development, environment, equity, and integration. Presents case studies in societal context.

SOC 3155 The Family

Analyzes social structure and social functions of the family as a social institution. Includes comparative and historical examination of relations between the family and other institutions in society.

SOC 3160 Women, Men, and Social Change

The Industrial Revolution and the corresponding changes in the labor force and patterns of domestic life have altered the sexual division of labor. In postindustrial society new institutional forms are recasting personal relations. Examines these forces of social change and their impact on sex roles.

SOC 3165 Sociology of Education

Analyzes the structure and functioning of educational institutions, and presents student, faculty, and administrative perspectives. Emphasizes the role of education in processes of socialization, social mobility, social change, and social control.

SOC 3166 Sociology and Anthropology in the Schools 4 QH

For current and perspective teachers of sociology and anthropology at the precollege and community college levels. Offers participants the opportunity to analyze curricula in their fields and consider alternative rationales for various approaches to teaching sociology and anthropology at these levels. Focuses on the potential uses of sociological and anthropological concepts in analyzing and solving educational problems. Students are expected to present either a course or unit they have prepared or a project they have planned or conducted utilizing a sociological or anthropological perspective.

SOC 3170 Intergroup Relations

Examines the relations between various racial, national, cultural, and religious groups with emphasis

on historical development. Pays particular attention to American society with its specific problems of adjustment and assimilation.

SOC 3171 Race and Ethnic Relations: A World Perspective

Offers cross-cultural analysis of race and ethnic relations in Western and non-Western societies. Explains race and ethnic relations in terms of contemporary developments, world problems, and ideological conflicts.

SOC 3175 Sociology of Work

Examines what effects the social organization of work has on the lives of workers and on the structure of society.

SOC 3176 Sociology of Occupations and Professions

Studies the relations between the occupations and professions and society. Special topics may include occupational stratification, professional group behavior, recruitment and socialization of occupations and professions, and political activism.

SOC 3185 Sociology of Deviant Behavior

Applies sociological concepts and principles to some problems of social disorganization in industrial societies. Analyzes such problems as suicide, prostitution, physical handicaps, unemployment, alcoholism, sexual deviance, and gambling.

SOC 3186, SOC 3187 Social Control 1, 2

Presents a seminar in research, theories, and methods in the sociology of social control.

SOC 3190 Sociology of Delinquency

Analyzes social and social psychological factors of delinquency and their implications for prevention, rehabilitation, and treatment.

SOC 3200 Sociology of Alcoholism

Examines four general problem areas: the conditions under which people categorize others as alcoholics; the processes by which persons so defined are assigned deviant status and assume appropriate roles and self-images as alcoholics; the development of drinking careers and their relationship to deviant subcultures; and the social situations in which people transform their deviant identities as alcoholics. Applies organizational analysis to the development and changing network of alcoholism treatment services and tries to develop some tentative generalizations on the social organization of alcoholism.

SOC 3205 Sociology of Crime and Justice

Presents a sociological and legal analysis of the criminal justice system, concentrating on police and law enforcement; plea-bargaining; courtroom research and trial strategies; sentencing; and prisoners' rights and corrections. Considers the relationship of race, social class, and crime, as well as the sociological explanations of crime causation.

SOC 3206 Sociology of Law

Reviews fundamentals of law. Includes the concept of social control, order and law, consensus and conflict, analysis of the normative-formative influences of law, mores and morals, the concept of justice, and analysis of some legal institutions.

SOC 3215 Sociology of Medicine

Studies social aspects of illness and medicine, historically and cross-culturally. Focuses on illness and the medical profession in modern society and their structural settings: the community, the hospital, the medical school. Critically examines research studies in the field and specifies problems for future research.

SOC 3225 Sociology of Aging

Examines the field of social gerontology, the nature and roots of ageism and topics such as elderly housing, life study, institutionalization, health care, retirement, leisure, and senior power.

SOC 3226 Processes of Aging

Considers socioeconomic and social psychological consequences of aging from the perspective of health-care providers. A major part of the course focuses directly on the biological changes entailed in aging and the appropriate medical management of geriatric patients. *Open to students expected to provide health-care services to geriatric patients.*

SOC 3240 Formal Organizations: Administration and Structure

Analyzes the goals and functions of modern organizations. Examines aspects of bureaucratization within business firms, public institutions, and private associations.

SOC 3245 Sociology of Poverty

Analyzes sociological perspectives on causes of poverty, public views on poverty, and institutional responses to poverty. Emphasizes a concern with policy issues and implementation of policies. *For advanced students in the social sciences and in the various human service schools in the University.*

SOC 3275 Sociology of Art

1 QH

Investigates the practices which lead to the production of artistic meaning. Topics include the relationship of art to society; the nature of artistic communities, their relationship to patronage systems and art markets; and how these systems are rooted in particular social and historical contexts.

SOC 3276 Popular Culture

Both pluralist and mass culture theories are in adequate in explaining mass popular culture; therefore, a primary objective of the course is to develop and refine an efficient theoretical framework. Problems addressed include the relationship of popular culture, high culture, and folk culture and the genesis and role of the mass media in industrial societies. Students also focus on empirical research in several forms of popular culture, including sports, rock music, and science fiction novels; and examine the organization and impact of market, stylistic shifts, and the viability of criticism.

SOC 3278 Mass Communication and Society

Studies the production, consumption, and meaning of media systems and their products in advanced industrial societies. Focuses on the legitimization and ideological function of mass media, especially its role in the reproduction and challenge of social relations. Explores the development of Western media; the economic and social organization of media institutions

and its impact on media products and their use; the existence of and possibilities for alternative media; and the impact of Western media in the third world.

SOC 3286 Sociology of Science

Presents selected topics dealing with interactions between science and society.

SOC 3300 Contemporary Sociological Theories

Analyzes major contemporary theories such as functionalism, conflict, neo-Marxism, and others. *Prereq. SOC 3100 and SOC 3101 or equiv. or permission of the instructor.*

SOC 3301 Recent Developments in Sociological Theory

This course is required for students in the PhD program who seek a comprehensive treatment of current developments in sociological theory. Among the schools that might be considered are: critical theory, modern Marxist theory, contemporary French theory, semiotics, hermeneutics, symbolic interactionist theory, and other emerging schools of thought. The specific content of the course changes periodically in order to keep the focus of the course on new horizons in theory. The relation of theory to research is also a main goal of the course. Topics selected and announced by the instructor in advance. *Prereq. SOC 3100 and SOC 3101 or equiv. or permission of instructor.*

SOC 3302 Sociology of Knowledge

Explores the relationship between the social base of a society and its intellectual products. Considers the viewpoints of authors such as Marx, Weber, Mannheim, G. H. Mead, the neo-Marxians, and other modern schools. *Prereq. SOC 3100 and SOC 3101 or equiv. or permission of instructor.*

SOC 3303 Economic Sociology

Discusses the role of economic factors in the social process. Considers both classic economic theory and its impact on classic social theory, and the potential interrelations between modern economic theory (especially model-building approaches) and general sociological problems.

SOC 3304 Feminist Theory

Traces major trends in feminist theory since the rise of the contemporary women's movement. Begins with early theories, identified as Marxist-Feminist, Socialist-Feminist, and Radical-Feminist, then considers important feminist issues: the origins and universality of women's oppression, the reproduction of gender in the family (neo-Freudian feminist and anthropological approaches), women's work under capitalism, and sexuality.

SOC 3310, SOA 3311 Social and Cultural Change 1, 2

Analyzes the changing patterns in social, economic, and political institutions. Discusses modern social trends. *Two-quarter course in conjunction with anthropology.*

SOC 3320 Multiple Regression in Sociological Analysis

Focuses on techniques of sociological analysis based on multiple regression. For example, use of coded variables, trend analysis, covariance analysis, and model testing. *Prereq. SOC 3115 and SOC 3117 or equiv.*

SOC 3321 Current Issues in Social Research

Examines selected topics in methods of social research. *Prereq.* SOC 3116 and SOC 3117 or equiv. or permission of instructor.

SOC 3322, SOC 3323 Experimental Methods in Social Research 1, 2

Studies experimental design and laboratory methods in sociology. The small groups laboratory is treated as a setting for testing sociological theory. Emphasizes techniques and problems in the creation and manipulation of social variables in the laboratory situation, while also considering the techniques of the natural experiment.

SOC 3325 Sociology of Policy, Planning, and Evaluation

Introduces the social, political, and economic factors affecting policy formation and the eventual success or failure of social programs in health, education, welfare, and urban planning. Stresses evaluation of policy alternatives and planning problems. *For advanced students in the social sciences and in the various human service schools of the University.*

SOC 3335 Seminar in Symbolic Interaction

Discusses the social psychology of groups as found in the works of Mead, Becker, Blumer, Goffman, and others.

SOC 3336, SOC 3337, SOC 3338 Seminar on Socialization 1, 2, 3

SOC 3336: Reviews theories and findings in organizational socialization. SOC 3337: Offers students the opportunity to design studies in organizational socialization. SOC 3338: Requires that students present results of their studies. *Not open to first-year students.*

SOC 3345 Community Analysis

Presents ecological theories of human relations with the physical environment. Develops the concept of, and discusses methods for, community study. Compares rural communities and urban neighborhoods. Discusses and evaluates community action programs.

SOC 3347 Seminar in Urban Social Policies 4 QH

Evaluates social science theories and methods from the perspectives of urban affairs. *Prereq.* Permission of instructor.

SOC 3355 Political Sociology

Presents sociological analysis of power relations and power systems with special attention to the bases of political power, processes of change in power, and the part played by violence and revolutionary movements.

SOC 3357 Comparative Socialism

Analyzes twentieth-century socialism from a comparative perspective. Covers the variety of "socialisms" that have developed in the Soviet bloc, China, Yugoslavia, and Cuba, as well as Western social democracy (Sweden) and Eurocommunism. Topics include political structure, class relations, industrial organization, cultural formations, dynamics of change, and democratization.

SOC 3360 Social Stratification

Places theories of inequality between groups in historical perspective, from classical to modern industrial times. Discusses and evaluates sociological research in social stratification with regard to different social and cultural groups.

SOC 3365 Social Movements

Studies various movements for social change from all points of the political spectrum. Gives special attention to the structural context, as well as to such processes of social movements as social base, leadership, strategy, and organization.

SOC 3390, SOC 3391 Seminar in Social Structure 1, 2

Relates current theories and research in sociology, social psychology, and social anthropology.

SOC 3405 Theories of Criminology

Examines theories and philosophies underlying various correctional systems, and schools of thought in criminology and penology. Traces theoretical approaches to the crime and delinquency problem from the beginnings of criminology to current thinking.

SOC 3410, SOC 3411, SOC 3412, SOC 3413 3 QH each Contemporary Issues in Sociology

Discusses contemporary issues in sociology. Includes supervised readings and written reports on special problems.

SOC 3430 Latin American Societies

Studies and analyzes selected Latin American societies with particular attention to such countries as Cuba, Mexico, Peru, and Brazil. Emphasizes urbanization and industrialization, and social and political change.

SOC 3431 Middle East Area Study

Presents a sociocultural analysis of the Middle East. Discusses ecological, structural, institutional, and normative factors in nomadic, rural, and urban life. Includes comparative regional analysis.

SOC 3470 Sociology of Religion

Offers a sociological analysis of religious institutions, and experiences in their historical and contemporary content. Considers religious and political context.

SOC 3485 Computers and Society

Offers a graduate seminar on the social impact of the computer "revolution" on the contemporary world. Topics include conditions of work, education, recreation, privacy, the computer science profession, paradigms of human thought, politics, and social change in the world economy.

SOC 3600, SOC 3601, SOC 3602 Seminar 3 QH each

Discusses selected topics in the field of sociology.

SOC 3603 Rhetoric in Sociology

Examines critically the conventional forms of sociological writings. Demonstrates how conventions differ by theoretical perspective and paradigm.

SOC 3615 Tutorial in Teaching**3 QH**

Discusses issues and problems in teaching. This is a required course for all doctoral candidates and should be taken during a quarter when the student has major responsibility for designing and executing a course in either sociology or anthropology. *Open to doctoral candidates only.*

SOC 3620, SOC 3621, SOC 3622 Doctoral Proseminar**1 QH each**

Designed to help socialize doctoral candidates for participation as professional sociologists and anthropologists. Topics include the nature of intellectualism and the functions of an intellectual in society today, the university as a structure and as a community of scholars, the nature of professional organizations, teaching sociology and anthropology, the organization of sociological and anthropological research, ethics in the profession, and the nature of applied sociological

and anthropological work. Offers participants the opportunity to acquire practical experience in self-presentation and giving colloquia. *Prereq. SOC 3321 and SOC 3300 or SOC 3301 or SOC 3302 or permission of instructor. Required of all doctoral candidates.*

SOC 3798 Master's Paper Continuation**0 QH****SOC 3799 Doctoral Dissertation Continuation****0 QH****SOC 3800, SOC 3801, SOC 3802****3 QH each****Directed Study in Sociology**

Comprises reading and research directed by a faculty member. *Open to doctoral candidates only.*

SOC 3810 Master's Paper in Sociology**3 QH**

Comprises empirical or library research meeting the criteria for publication in a professional journal. *Supervised by members of the department.*

SOC 3820 Doctoral Dissertation**0 QH****Biology****BIO 3411 Evolution****4 QH**

Reviews the theories of evolution, evidence, and mechanisms of speciation. Lab consists of term paper and presentation. *Prereq. BIO 1104 or BIO 1107 and BIO 1260.*

BIO 3441 Vertebrate Zoology**4 QH**

Surveys the diversity, systematics, anatomy, physiology, and ecology of all vertebrate classes of New England. Lab consists of field observations, museum trips, and specimen study. *Prereq. BIO 1104 or BIO 1107 and BIO 1211.*

BIO 3446 Ornithology**4 QH**

Examines the diversity, systematics, anatomy, physiology, and ecology of the birds of the world. Lab consists of field observations and specimen study. *Prereq. BIO 1104 or BIO 1107 and BIO 1211.*

BIO 3448 Mammalogy**4 QH**

Studies the diversity, systematics, anatomy, physiology, and ecology of the mammals of the world. Lab consists of field collection and specimen preparation and study. *Prereq. BIO 1104 or BIO 1107 and BIO 1211.*

BIO 3450 Immunology**4 QH**

Presents an overview of the structure and function of genes, proteins, and cells involved in the generation of the immune response. Emphasizes molecular immunology and immunogenetics. *Prereq. BIO 3564 and BIO 3565; concurrent registration in BIO 3565 acceptable.*

BIO 3460 Current Topics in Cell Biology**4 QH**

Explores topics of current interest in the biochemistry and molecular biology of cells. Topics may include protein synthesis and translocation; biosynthesis and recycling of membranes; receptor structure and function; organelle structure, biosynthesis, and function;

and DNA replication and macromolecular assemblies. *Prereq. BIO 3564 and BIO 3565 or equivs.*

BIO 3501 Biological Laboratory Computing**4 QH**

Introduces students to the basic techniques of interfacing biological experiments to computers, using lectures that present problems to be solved by applying contemporary microcomputing devices. Surveys the architecture of a lab computing system; discusses problems inherent in applying contemporary lab input/output devices; and provides the background in graphics and database management necessary for generating reports.

BIO 3509 Principles of Systematics**4 QH**

Surveys the theories and techniques employed in plant and animal systematics and the rules according to the International Codes of Zoological and Botanical Nomenclature. *Prereq. Permission of instructor.*

BIO 3510 Environmental and Population Biology**2 QH**

Examines physiochemical factors influencing and influenced by organisms. Explores interaction among individual organisms and among species. Students are expected to participate in lectures and labs given for BIO 1211, and are assigned individual work on specialized aspects of ecology. *Prereq. One year of general biology, including plant and animal biology. Open only to graduate students completing deficiencies in entrance requirements.*

BIO 3512 River Ecology Laboratory**3 QH**

Comprises two four-hour sessions per week (combined lecture and lab). Covers chemical determinations, measurement of primary and secondary production, and organismal identification in flowing waters of different types.

BIO 3513 Benthic Marine Ecology: Techniques**4 QH**

This advanced graduate-level course examines new research techniques for studying the ecology, behavior,

and biology of marine benthic invertebrates. The focus is on a small number of field and lab techniques, rather than attempting an exhaustive survey of all the existing research methods in benthic ecology. Each lab/field exercise is conducted as a mini research project. Students discuss the philosophy of experimental design and learn research techniques, including spectrophotometric analysis of sediment nutrient content, hydrodynamical analysis of larval recruitment, quantification of invertebrate growth, current velocity measurement, and multivariate statistical analysis.

BIO 3514 Salt Marsh Ecology 3 QH

Studies the mechanisms of salt marsh formation, including major plants and the factors affecting distribution; the distribution and interaction of animals; productivity; and foodwebs and energy flow. Discusses the relationship of marsh to bay in the estuarine system, marsh pools as a sub-habitat, and the effect of people using the tidal marsh. *Prereq.* BIO 1211.

BIO 3515 Salt Marsh Ecology Laboratory 2 QH

Examines major plants and animals of marsh surfaces and pools. Analyzes distribution in field, measurement of plant productivity, fish feeding, and the ecology of mosquitos and zooplankton. Offers a mixture of field and lab work, with studies varied according to the season. *Prereq.* BIO 3514.

BIO 3516 Aquatic Ecology

Studies rivers, lakes, and estuaries. Focuses on physical and chemical factors, seasonal and regional variations of these factors, interactions between these factors and the effects on the biotic community. Examines examples of current and classical ecological research in each of the three aquatic communities. *Prereq.* BIO 1211.

BIO 3517 Lake Ecology Laboratory 3 QH

Comprises two four-hour sessions per week (combined lecture and lab). Topics include chemical determinations, measurement of primary and secondary production, and organismal identification in lakes of different types.

BIO 3518 Ecology of Salt Marshes 3 QH

Surveys fauna and flora, environmental factors affecting them, and current biological and social problems associated with salt marshes. Meets for two lectures of one-to-three hours each, and one full day of lab for six weeks during the summer quarter. *Prereq.* BIO 1211 and BIO 3511 or equiv.

BIO 3519 Ecology of Rocky Shores 4 QH

Examines current ecological concepts regarding rocky intertidal and subtidal communities. Covers the influence of biotic and abiotic factors on composition, distribution, and diversity of plant and animal species.

BIO 3520 Environmental Microbiology 4 QH

Studies the microbial environment and ecology of the cell. Explores interactions between microbial populations, stressing soil and freshwater associations. *Prereq.* BIO 1320 or equiv.

BIO 3521 Food Microbiology 3 QH

Investigates microbiology of food with emphasis on pathogenic types and their interactions with other

groups indigenous to food. Discusses food fermentations, food processing, and environmental factors influencing growth and development of microorganisms in food. *Prereq.* BIO 1320 or equiv.

BIO 3522 Food Microbiology Laboratory 2 QH

Focuses on detection, quantification, and isolation of microorganisms and their products of significance in food with emphasis on the pathogenic types. *Prereq.* BIO 3521; may be taken concurrently.

BIO 3525 Theoretical Ecology 4 QH

Studies population and community ecology, with emphasis on mathematical modeling of ecological processes. Recognizes current ecological literature, including theory developed over the past twenty years in such areas as energetics of organism growth, population dynamics and regulation, and the organization and temporal dynamics of entire communities. Gives students the applied mathematical tools necessary to work with and understand current modeling approaches. *Prereq.* *Introductory ecology or evolution, and one year of calculus.*

BIO 3527 Animal Virology 3 QH

Examines physical and chemical properties of viruses, viral replication, genetics, cytopathology, and tumor viruses. Covers medical virology, including pathogenesis, clinical features, epidemiology, and immunization of the common viral diseases. *Prereq.* BIO 1320 or equiv.

BIO 3528 Animal Virology Laboratory 2 QH

Studies cultivation and identification of viruses. Includes use of animals, eggs, and animal cell cultures for viral assays. *Prereq.* BIO 3527; may be taken concurrently.

BIO 3531 Plant Growth and Reproduction 4 QH

Investigates plant hormones, growth, development, and physiology of reproduction.

BIO 3547 Biomechanics 1, Theory 4 QH

Introduces engineering theory and techniques as applied to the disciplines of morphology, evolution, and ecology. Includes material properties, structural elements and systems, and elementary fluid dynamics. Lab emphasizes biological materials in a mechanical sense, the physical biology of flow, and an examination of the fundamental principles of physical laws that affect living organisms. *Prereq.* *Permission of instructor.*

BIO 3548 Biomechanics 2, Applications 4 QH

Presents a forum for research in biomechanics in which students are expected to develop and execute a research project. In addition, current areas of biomechanical research will be reviewed and evaluated. *Prereq.* BIO 3547 and permission of instructor.

BIO 3549 Physiology and Biomechanics of Animal Activity 3 QH

Offers an integrated study of the physiological and biomechanical systems that support locomotory activity in animals. The first part is devoted to the structure and function of skeletal muscle and to respiratory and cardiovascular adaptations for activity. The remain-

der integrates physiological and biomechanical information related to flying, swimming, and terrestrial locomotion. *Prereq.* General physiology.

BIO 3550 Cardiovascular Physiology 3 QH
Studies the physiology of blood cells, anemia, polycythemia immunity, and allergy. Examines electrophysiology of the heart, cardiac cycle, EKG, hemodynamics, capillary dynamics, pulmonary circulation, cardiovascular reflexes, cardiac output, and venous return. Also covers cardiac failure, coronary circulation, atherosclerosis, hypertension, cerebral circulation, and circulatory shock.

BIO 3551 Cardiovascular Physiology Laboratory 1 QH
Offers three hours of laboratory study per week. *Prereq.* BIO 3550.

BIO 3552 Osmotic and Ionic Regulation 2 QH
Investigates comparative physiology of regulation and transport of water and the principal solutes in animals. Discusses principles and underlying mechanisms as well as examples selected from a variety of phyla. *Prereq.* Basic physiology.

BIO 3553 General Physiology of Invertebrates 4 QH
Reviews basic animal functions as manifested among the major groups of invertebrates, with comparisons to the vertebrates, especially aquatic vertebrates. Considers the cellular and biochemical bases for the functions, their control, their adaptiveness to diverse environments, and their evolutionary implications. Topics usually include respiration, circulation, nutrition, metabolism, excretion, salt and water balance, temperature responses, biological clocks, sensory organs, and various effector organs.

BIO 3554 Comparative Vertebrate Physiology 4 QH
Considers physiological principles in the context of the phylogenetic diversity of the vertebrates, histories and environments and makes comparisons with invertebrate systems when appropriate. Topics include energetics, temperature regulation, skeletal muscle, and salt and water balance. Lab. *Prereq.* BIO 1261 or equiv.

BIO 3555 Topics in Ecological Physiology 2 QH
Explores physiological studies that reveal how animals have adapted to aspects of their life histories and environments. Illustrates how studies that cross the boundaries between ecology and physiology enrich our understanding of animal function. Selects topics from the current literature and covers terrestrial, freshwater, and marine ecosystems.

BIO 3558 Vertebrate Endocrinology 3 QH
Studies principles of hormonal regulation of physiological processes in vertebrates, mechanisms of hormone action, and neuroendocrine relationships.

BIO 3559 Animal Nutrition 2 QH
Offers detailed consideration of organic and inorganic nutritional requirements of humans and selected animals. Covers digestion, absorption, and metabolism of nutrient materials. Examines role of vitamins, minerals, and trace elements in metabolism. Topics also include variation in nutritional needs among normal individuals and in various physiological and genetic patholo-

gies, and evaluation of food additives and of permissible levels of toxic materials in food. *Prereq.* Basic biochemistry or permission of instructor.

BIO 3560 Genetics and Developmental Biology 2 QH
Elaborates the classic laws of heredity, including cytogenetics and chemical basis of heredity. Presents selected examples of the development of form and function. Requires that students participate in lectures and labs given for BIO 1260 and perform extra individual work. *Prereq.* General biology. *Open only to graduate students completing deficiencies in entrance requirements.*

BIO 3561 Cell Physiology and Biochemistry 2 QH
Examines basic chemical and physical processes of cells related to their fine structure; oxidative and intermediary metabolism, photosynthesis, and membrane phenomena; movement; and chemical and physical processes of prokaryotic and eukaryotic cells. Requires that students participate in lectures and labs given for BIO 1261 and perform extra individual work. *Prereq.* General biology, college physics, and organic chemistry. *Open only to graduate students completing deficiencies in entrance requirements.*

BIO 3563 General Biochemistry Laboratory 4 QH
Introduces modern research techniques used in biochemistry and molecular biology. Topics include purification and characterization of proteins, kinetic properties of enzymes, isolation of high molecular weight DNA, recombination of DNA molecules in vitro, isolation of bacterial clones containing recombinant molecules, and in vitro mutagenesis. The course includes two hours of lecture and seven hours of lab. *Prereq.* Permission of instructor.

BIO 3564 General Biochemistry 1 4 QH
Surveys biochemistry emphasizing protein structure, the nature of enzymic catalysis, bioenergetics, and the metabolism of carbohydrates, lipids, and amino acids. *Prereq.* organic chemistry and introductory biochemistry or equivs.

BIO 3565 Molecular Biology 4 QH
Emphasizes experimental design and proof in macromolecular chemistry and genetics. Studies current theories of the detailed molecular mechanisms for the preservation, expression, and evolutionary development of biological information. Emphasizes applications to general biological and health problems. *Prereq.* BIO 3564 or equiv.

BIO 3566 General Biochemistry 3 4 QH
Emphasizes the structure and function of organelles, mechanisms of hormonal control of metabolism, and gene regulation. *Prereq.* BIO 3564 and BIO 3565 or equivs.

BIO 3569 Microbial Genetics 3 QH
Studies the principles and practical application of the genetics of microorganisms. Emphasizes genetic exchange in bacteria mediated by bacteriophage and plasmids. Also discusses several eukaryotic systems. *Prereq.* BIO 1320 or equiv.

**BIO 3573 Ocean, Coastal, and Shore Studies 4 QH
for Teachers**

Introduces oceanography, marine biology, and marine ecology, with an emphasis on developing simple classroom and field activities for high school curricula. *Geared for high school teachers and potential teachers.*

BIO 3577 Malacology 4 QH

Investigates functional morphology, embryology, systematics, and ecology of the major groups of molluscs. *Prereq. Invertebrate zoology.*

BIO 3601 Biological Electron Microscopy 4 QH

Presents techniques of electron microscopy applied to biological materials. Discusses specimen preparation, fixation, thin-sectioning, staining, operation of electron microscope, photographic techniques, and interpretation of electron micrographs. Requires student seminars and project. *Prereq. Permission of instructor.*

BIO 3605 Developmental Neurobiology 3 QH

Provides an overview of developmental neurobiology, focusing on mechanisms for the formation and differentiation of nervous systems and nerve cells. Examines the relationship between nervous system development and behavior development. Topics include the early formation of nervous systems, pattern formation, neural movement and migration, growth and differentiation of nerve cells, formation of specific synaptic connections between cells, neural plasticity, and modification of neural organization by the environment. Topics not restricted to the embryology of any particular animal group (for example, vertebrates or invertebrates), but organized around the variety of animals and experimental preparations used to study neural development mechanisms. *Prereq. BIO 1452 or equiv.*

BIO 3607 Advanced Developmental Biology 3 QH

Studies current concepts of animal and plant development at the molecular and physiological levels. Topics include nucleic acid and protein synthesis in development, metabolic activation at fertilization, regulation of the eukaryotic genome, control of cell differentiation, and molecular communication between cells. Stresses reading and interpretation of the primary literature. Includes three hours of lecture per week.

BIO 3608 Advanced Developmental Biology Laboratory 2 QH

Analyzes the fundamental problems of development through experimental techniques. Covers the culture of vertebrate and invertebrate embryos, microsurgical analysis of morphogenesis, biochemistry of development, cell-cell interactions, and organ and tissue culture. Includes five hours of lab per week. *Prereq. BIO 3607 or permission of instructor.*

BIO 3609 Cellular Aspects of Development 3 QH

Studies animal and plant development at the cellular level. Topics include cell-cell interaction, cell surface differentiation, differential cell adhesion, genetic and epigenetic control or pattern formation, and ultrastructural aspects of fertilization and development. Stresses reading and interpretation of the primary literature. Includes three hours of lecture per week.

BIO 3610 Human Ecology

Examines human tolerance for natural and unnatural environmental factors and man's activities affecting these factors. Studies man, food, and population dynamics.

BIO 3617 Environmental Law 2 QH

Reviews the scientific information required for implementation of the legal and political aspects of environmental management. Discusses the role of the scientist as an expert witness. Studies scientific and legal predictability. Presents analyses of suitable dynamic models and case law with the goal of improving the results of legal, political, and scientific decisions bearing upon remedial environmental management. *Prereq. Biology core and first course in physiology, such as BIO 1258 and BIO 1259.*

BIO 3620 Industrial Microbiology 3 QH

Investigates microorganisms and methods employed in production of products of economic and medical importance, decomposition of wastes, and control of desirable and unwanted processes and biodeterioration. Emphasizes fermentation processes. *Prereq. BIO 1420 or equiv., or permission of instructor.*

BIO 3621 Industrial Microbiology Laboratory 2 QH

Offers lab and discussion seminar sessions devoted to the study of selected commercial processes.

BIO 3652 Comparative Neurobiology 3 QH

Presents a cellular approach to structure and function of the nervous system. Topics include neuronal anatomy, cellular properties of single neurons, synaptic transmission, integration in nerve cells, nerve networks, sensory systems, motor systems, sensory-motor integration, specification of neuronal connectivity, and phylogeny of nervous systems. *Prereq. General (animal) physiology.*

BIO 3657 Neurophysiology Laboratory 2 QH

Introduces neurophysiological methods. *Prereq. BIO 3652; may be taken concurrently.*

BIO 3661 Human Genetics 3 QH

Applies basic genetic principles to the study of variability in humans. Focuses primarily on cytogenetics, biochemical genetics, monogenetics, and multifactorial inheritance and population genetics. Topics of special interest include sex determination and differentiation, early embryology, twinning, birth-defect etiology, prenatal diagnosis, and genetic counseling. *Prereq. BIO 1260 or equiv.*

BIO 3662 Immunochemistry 4 QH

Involves intensive discussion and application of modern immunochemical topics and lab techniques. Topics include in vitro immunization of spleen cells, preparation of monoclonal antibodies, antibody-labelling procedures, enzyme-linked immunoassays (ELISA), immunofluorescence, immunoaffinity chromatography, and immunoelectrophoresis. The course consists of two hours of lecture and six hours of lab per week in two sessions of four hours each.

BIO 3663 Molecular Biology of Viruses 4 QH

Studies the growth of selected DNA and RNA viruses. Topics will include viral transcription, replication, control of viral growth and interactions with the host cell both in lytic growth and viral oncogenesis. *Prereq. BIO 3565 or equiv.*

BIO 3665 Biochemical Adaptation 3 QH

Living systems share, at the biochemical level, common mechanisms of enzymatic catalysis, energy transformation, storage and expression of genetic information, and development, growth, and differentiation. Despite this fundamental unity, organisms have evolved adaptive biochemical modifications that enable surviving and reproducing in diverse natural environments. This syllabus focuses on the fundamental strategies of adaptation and respiratory proteins, water-solute adaptations, and adaptations to extreme temperatures and to the deep sea. *Prereq. BIO 3564 or permission of instructor.*

BIO 3667 Biochemistry Laboratory Rotation 1 3 QH

Offers experience in biochemical research; students spend six weeks in each of two labs during the winter quarter. *Required of all first-year graduate students in biochemistry, cell physiology, and molecular biology.*

BIO 3668 Biochemistry Laboratory Rotation 2 3 QH

Offers a continuation of BIO 3667 during the spring quarter.

BIO 3669 Biochemistry Laboratory Rotation 3 3 QH

Offers a continuation of BIO 3668 during the summer quarter. Intended for students who have not yet chosen a lab in which to carry out thesis work.

BIO 3670 Developmental Biology of Marine Invertebrates 4 QH

Offers descriptive and experimental studies of embryonic and larval development of marine invertebrates. Lab work includes observation and experimentation using live material from a broad spectrum of invertebrate phyla. (Marine Science and Maritime Studies Center.)

BIO 3672 Ichthyology 4 QH

Studies natural history and systematics of fishes, with emphasis on marine species. (Marine Science and Maritime Studies Center.) *Prereq. Comparative anatomy or vertebrate zoology.*

BIO 3690 Seminar 1 QH

Examines various topics and recent developments in botany, biochemistry, microbiology, molecular biology, physiology, and zoology in depth. Emphasizes student presentations. *To facilitate the planning of assignments, students are urged to contact the instructor during the quarter before the seminar is to be offered.*

BIO 3699 Doctoral Dissertation 0 QH

Requires original research in depth, representing a significant contribution of new biological knowledge, and a written dissertation thereon, under the supervision of a graduate faculty member.

BIO 3701 (1 QH), BIO 3702 (2 QH), BIO 3703 (3 QH), BIO 3704 (4 QH) Master's Thesis

Presents research methods and their application to a specific problem, under the direction of a graduate faculty member.

BIO 3711 (1 QH), BIO 3712 (2 QH), BIO 3713 (3 QH), BIO 3714 (4 QH) Special Investigations in Biology

Involves faculty-guided studies that are not directly related to research pursued for thesis or dissertation. May take the form of a special course.

BIO 3721 (1 QH), BIO 3722 (2 QH), BIO 3723 (3 QH), BIO 3724 (4 QH) Special Topics in Biology

Offers special study of a selected topic under the direction of a faculty member, preliminary to submission and approval of MS thesis proposal or MS in literature dissertation proposal. Credits are convertible to MS thesis or MS dissertation.

BIO 3731 (1 QH), BIO 3732 (2 QH), BIO 3733 (3 QH), BIO 3734 (4 QH) Master's Literature Dissertation

Focuses on extensive research of the primary literature under direction of a graduate faculty member, leading to a comprehensive written review of a significant biological problem and an oral examination.

BIO 3741 (1 QH), BIO 3742 (2 QH), BIO 3743 (3 QH), BIO 3744 (4 QH) Doctoral Research

Presents research methods and their application to a specific problem, under the direction of a graduate faculty member.

BIO 3790 Perspectives in Biology 1 QH

Discusses current developments in one of the fields of biology. Each weekly meeting will focus on a presentation by an invited expert. In-class discussion must be supplemented by written assignments. No more than 2 QH of this course may be applied to satisfy the 4 QH seminar requirement for the MS or MSHS degree.

BIO 3798 Master's Thesis Continuation 0 QH**BIO 3799 Doctoral Dissertation Continuation 0 QH**

Chemistry

All courses carry two quarter-hours of credit unless otherwise specified.

I. Introductory Courses

CHM 3231 Analytical Chemistry 1 QH
Introduces analytical chemistry to students whose background in the subject is deemed inadequate. *Prereq. Permission of the departmental academic standing committee.*

CHM 3271 Organic Chemistry 1 1 QH
Introduces organic chemistry to students whose background in the subject is deemed inadequate. *Prereq. Permission of the departmental academic standing committee.*

CHM 3272 Organic Chemistry 2 1 QH
Continues CHM 3271. *Prereq. Permission of the departmental academic standing committee.*

CHM 3273 Organic Chemistry 3 1 QH
Continues CHM 3272. *Prereq. Permission of the departmental academic standing committee.*

CHM 3381 Physical Chemistry 1 1 QH
Offers a beginning course in physical chemistry concentrating on chemical thermodynamics for students whose background in the subject is deemed inadequate. *Prereq. Permission of the departmental academic standing committee.*

CHM 3382 Physical Chemistry 2 1 QH
Continues CHM 3381. Concentrates on phase equilibria, solutions, kinetic theory of gases, and chemical kinetics. *Prereq. Permission of the departmental academic standing committee.*

CHM 3383 Physical Chemistry 3 1 QH
Offers a beginning course in physical chemistry, concentrating on quantum chemistry, particles and waves, and Schrodinger wave mechanics for students whose background in the subject is deemed inadequate. *Prereq. Permission of the departmental academic standing committee.*

CHM 3431 Instrumental Analysis 1 QH
Offers a beginning course in instrumental analysis for students whose background in the subject is deemed inadequate. *Prereq. Permission of the departmental academic standing committee.*

CHM 3441 Inorganic Chemistry 1 QH
Offers a beginning course in inorganic chemistry for thesis students whose background in the subject is deemed inadequate. *Prereq. Permission of the departmental academic standing committee.*

CHM 3461 Identification of Organic Compounds 1 QH
Offers a beginning course in the identification of organic compounds dealing with the qualitative analysis of organic compounds and mixtures, using physical methods. Designed for students whose background in

the subject is deemed inadequate. *Prereq. Permission of the departmental academic standing committee.*

CHM 3510 Special Projects in Chemistry 4 QH
Offers lab studies for nonthesis research. *Prereq. Permission of the departmental academic standing committee.*

II. Required Regular Courses

CHM 3521 Analytical Separations
Studies theory and practice of analytical separation techniques. Emphasizes fundamentals as they relate to practice. Topics for examination are based mainly on chromatographic processes including gas and high speed liquid chromatography. Other topics include zone refining, liquid-liquid extraction, and electrophoresis.

CHM 3522 Advanced Analytical Separations
Continues CHM 3521. *Prereq. CHM 3521.*

CHM 3523 Electroanalytical Chemistry 1
Examines theory, practice, instrumentation, and applications of selected electroanalytical methods of analysis. Topics will be selected from among the following methods: pH, ion selective electrodes, potentiometric titrations, voltammetry, coulometry, and conductivity measurements.

CHM 3524 Electroanalytical Chemistry 2
Offers a continuation of CHM 3523. Considers equilibrium and nonequilibrium techniques in electroanalytical chemistry. Covers electrode processes, chronopotentiometry, cyclic voltammetry, and recent advances in electroanalytical chemistry. *Prereq. CHM 3523.*

CHM 3525 Optical Methods of Analysis 1
Studies theory and principles of molecular absorption and emission processes, instrumentation for optical methods of analysis, and specific applications and approaches for use of optical methods. Specific topics include ultraviolet-visible, fluorescence/phosphorescence, infrared, Raman, refractometry, interferometry, polarimetry, circular dichroism, optical rotatory dispersion, light scattering for polymer analysis, optical absorption/emission detectors for HPLC, chemiluminescence, micellar enhancement in spectroscopy, and other special topics of recent development and application.

CHM 3526 Optical Methods of Analysis 2
Examines principles and applications of atomic spectroscopy. Discusses such topics as atomic emission, atomic absorption, atomic fluorescence, X-ray absorption, fluorescence and diffraction, and electron.

CHM 3527 Analytical and Organic Mass Spectrometry

Covers theory and practice of mass spectrometry in chemical analysis. Studies principles of formation of mass spectra of organic compounds, and modern ancillary techniques using mass spectrometric detectors. *Prereq.* One year of organic chemistry and instrumental analysis.

CHM 3529 Chemical Instrumentation 1: Measurements and Control

Presents a lecture lab course illustrating the design of electronic instruments used for chemical measurements. Topics include circuit analysis, transducer characteristics, circuits using basic semiconductor devices, integrated circuits, signal amplification, and signal processing. Emphasizes interfacing and interrelation of circuits.

CHM 3530 Chemical Instrumentation 2: Computer Interfacing

Offers a lecture lab course illustrating the interface to chemical instruments. Topics include digital logic, computer architecture, data processing, A/D and D/A conversions, and parallel and serial input/output. Provides detailed coverage of standard interfaces such as the 20 ma current loop, RS-232C, and the IEEE-488 GPIB. *Prereq.* CHM 3529.

CHM 3531, CHM 3532 Topics in Analytical Chemistry 1, 2

Presents selected topics of current importance in analytical chemistry. *Prereq.* Permission of instructor.

CHM 3541 Advanced Inorganic Chemistry 1

Discusses application of basic quantum chemistry to inorganic systems. Covers Russell-Saunders and j-j coupling, stereochemistry of nontransition-metal compounds, and bonding and structure of electron-deficient systems.

CHM 3542 Advanced Inorganic Chemistry 2

Covers magnetic properties; electronic spectra and selection rules; thermodynamic stability of coordination compounds; and experimental techniques of inorganic chemistry. *Prereq.* CHM 3541.

CHM 3543 Advanced Inorganic Chemistry 3

Examines crystal symmetry. Offers introduction to theory of solids; semiconductors and metals; non-stoichiometric compounds; and solid-state reactions. Application of molecular orbital theory. Covers determination of electron distribution in transition metal compounds, Mossbauer spectroscopy, and advanced magnetochemistry. *Prereq.* CHM 3542 and CHM 3591.

CHM 3561, CHM 3562 Advanced Organic Chemistry 1, 2

Presents an intensive survey of organic reactions. Uses modern concepts of structure and mechanism to correlate factual material. *Prereq.* One year of organic chemistry.

CHM 3563 Physical Organic Chemistry

Examines topics in basic physical organic chemistry, including molecular polarity, equilibrium and kinetics, reactivity and structure, solvent effects, acid-base catalysis, orbital symmetry, and aromaticity. *Prereq.* CHM 3562 or permission of instructor.

CHM 3564 Spectrometric Identification of Organic Compounds

Studies interpretation of the ultraviolet, infrared, and nuclear magnetic resonance spectra of organic compounds. *Prereq.* One year of organic chemistry.

CHM 3581 Chemical Thermodynamics 1

Covers First Law of Thermodynamics, Thermochemistry Second and Third Laws, free energies, and reaction and phase equilibria. *Prereq.* Permission of instructor.

CHM 3582 Chemical Thermodynamics 2

Introduces partial molar properties, solutions, and electrolytes. Focuses on statistical analogues of entropy and free energy, and partition functions. *Prereq.*

CHM 3583 Chemical Thermodynamics 3

Explores statistical thermodynamics applied to gases, liquids, solids, and irreversible thermodynamics. *Prereq.* CHM 3582 and CHM 3592.

CHM 3591 Introductory Quantum Chemistry 1

Introduces quantum mechanics and applications to simple systems. Topics include: perturbation theory and applications, harmonic oscillator, rigid rotor and applications to microwave and infrared spectroscopy, simple atoms. *Prereq.* One year of physical chemistry.

CHM 3592 Introductory Quantum Chemistry 2

Examines the variational method, the chemical bond, and the LCAO method. Surveys group theory and applications, molecules and Woodward-Hoffman rules. *Prereq.* CHM 3591.

CHM 3593 Introductory Quantum Chemistry 3

Surveys applications of group theory and simple approximate theories to conjugated molecules. Studies the SCF method and its application to atoms and molecules, and applications to molecular spectroscopy. *Prereq.* CHM 3592.

CHM 3594 Chemical Kinetics

Explores use of experimental data to deduce the rate law of a reaction. Covers mechanisms deduced from rate laws, and the influence of experimental error on precision of rate constants and activation energies. Examines collision and transition-state theories of reaction rates. *Prereq.* One year of physical chemistry.

III. Advanced Courses

CHM 3641 Coordination Chemistry

Discusses solution phase properties of coordination compounds and experimental methods for the study of thermodynamics stability and kinetic lability. Topics also include kinetics and mechanism of solvent exchange and substitution reactions at transition metal centers. Investigates the classification of redox reaction mechanisms, Marcus theory, and phenomenological mechanisms. *Prereq.* CHM 3543.

CHM 3642, CHM 3643, CHM 3644, CHM 3645 Special Topics In Inorganic Chemistry 1, 2, 3, 4

Focuses on advanced topics of importance in inorganic chemistry including advanced ligand field theory: crys-

tal field theory of ions in weak and strong fields. Examines molecular orbital theory of transition metal complexes. Analyzes the crystal structure determination in solids: crystallography, X-ray, electron and neutron diffraction techniques applied to inorganic, bio-inorganic, and other solids. Introduces resonance spectroscopy in inorganic chemistry, including electron spin, nuclear magnetic, and nuclear quadrupole resonance; and Mossbauer spectroscopy. Considers solid-state chemistry: thermal, magnetic and transport properties, phase transformations and crystal defects; surface effects, and material preparation techniques. *Prereq. CHM 3542 and permission of instructor.*

CHM 3661, CHM 3662 Organic Stereochemistry and Reaction Mechanisms 1, 2

Studies interrelations of the stereochemistry of organic molecules with their physical and chemical behavior. Examines conformational analysis, and the effects of spatial relationships on transition states, equilibria, and reaction rates as an introduction to the study of organic reaction mechanisms. *Prereq. CHM 3563.*

CHM 3663, CHM 3664 Organic Reaction Mechanisms and Organic Synthesis 1, 2

Discusses the fundamental factors influencing the courses of organic reactions. Topics include substitution reactions, pericyclic reactions, and synthetic methods as an introduction to organic synthesis. *Prereq. CHM 3662 (may be taken concurrently).*

CHM 3671, CHM 3672, CHM 3673 Special Topics in Organic Chemistry 1, 2, 3

Covers selected topics of current importance in organic chemistry. *Prereq. CHM 3562 and permission of instructor.*

CHM 3681, CHM 3682, CHM 3683 Special Topics in Physical Chemistry 1, 2, 3

Studies advanced topics of importance in physical chemistry including quantum chemistry: linear algebra and the formulation of quantum theory. Examines angular momentum, group theory, small molecules, and time-dependent theory and selected advanced topics. Explores statistical mechanics and quantum statistics. Topics also include electrons in metals, photons, and phonons; superconductivity; fluctuations, noise, and irreversible thermodynamics; transport phenomena; and phase transitions of high order. *Prereq. Permission of instructor.*

CHM 3800 Analytical Seminar

1 QH

Focuses on oral reports by the participants on current investigations in analytical chemistry. *Prereq. Enrollment in full-time program.*

CHM 3801 Inorganic Seminar

1 QH

Focuses on oral reports by the participants on current investigations in inorganic chemistry. *Prereq. Enrollment in full-time program.*

CHM 3802 Organic Seminar

1 QH

Presents oral reports by the participants on current investigations in organic chemistry. *Prereq. Enrollment in full-time program.*

CHM 3803 Physical Chemistry

1 QH

Considers oral reports by the participants on current investigations in physical chemistry. *Prereq. Enrollment in full-time program.*

CHM 3810 Master's Research

6 QH

Offers the chance to conduct original research, under supervision of a faculty member, leading to a written thesis thereon or to the establishment of doctoral candidacy.

CHM 3820 Doctoral Research and Dissertation

0 QH

Offers the opportunity to complete original research in depth, representing a significant contribution of new chemical knowledge, and a written dissertation thereon, under the supervision of a faculty member. *Prereq. Doctoral candidacy.*

IV. Electives

INT 3101 Biochemistry 1

Discusses the structures and chemistries of carbohydrates, proteins, lipids, nucleic acids, and selected cofactors. *Prereq. One year organic chemistry.*

INT 3102 Biochemistry 2

Discusses enzymes, enzyme kinetics, and mechanisms of enzyme reactions, of intermediary metabolism and of bioenergetics, biological oxidation-reduction reactions and the electron transport chain. Considers carbohydrate metabolism including the glycolytic pathway, the citric acid cycle and the pentose phosphate pathway. *Prereq. INT 3101.*

INT 3103 Biochemistry 3

Continuation of intermediary metabolism from INT 3102, including lipid, protein, and nucleic acid metabolism, photosynthesis, and cell regulation. *Prereq. INT 3102.*

Economics

All courses carry three quarter-hours of credit unless otherwise specified.

ECN 3005 General Economics 0 QH

Surveys macroeconomic and microeconomic concepts, theories, and techniques for students with a limited background in economics or who need a refresher course.

ECN 3010 Introduction to Microeconomic Theory 0 QH

Covers basic microeconomic theory, including consumption, production and cost theory, market structure, and welfare economics. Designed for MA degree students who need to improve their background in micro theory. Carries no academic credit toward the MA or PhD programs.

ECN 3020 Introduction to Macroeconomic Theory 0 QH

Covers basic Keynesian macroeconomic theory, emphasizing analytical concepts and tools, with some application to macroeconomic problems and public policy. Designed for MA degree students who need to improve their background in macro theory. Carries no academic credit toward the MA or PhD programs.

ECN 3030 Introduction to Mathematics for Economists 0 QH

Acquaints students with the matrix algebra and elementary calculus necessary for quantitative economics: simultaneous linear systems; polynomial, logarithmic, and exponential functions; and elementary differential and integral calculus. Designed for MA students who need to improve their background in mathematics. Carries no credit toward the MA or PhD degrees.

ECN 3040 Introduction to Statistics 0 QH

Introduces statistical methods and techniques used in economic analysis. Studies descriptive statistics, time-series and index number problems, sampling problems, probability theory, and hypothesis testing. Designed for MA degree students who need to improve their background in basic statistics. Carries no academic credit toward the MA or PhD programs.

ECN 3110 Introduction to Microeconomic Theory 4 QH for Master of Science Students

Covers basic microeconomic theory, including consumption, production and cost theory, market structure and welfare economics. This course is equivalent to ECN 3010.

ECN 3120 Introduction to Macroeconomic Theory 4 QH for Master of Science Students

Covers basic macroeconomic theory with an emphasis on analytical concepts and tools with some application to macroeconomic problems and public policy. This course is equivalent to ECN 3020.

ECN 3130 Introduction to Mathematics for Economists for Master of Science Students

Seeks to acquaint the student with the algebra and elementary calculus necessary for quantitative economics: simultaneous linear systems; polynomial, logarithmic and exponential functions; and elementary differential and integral calculus. This course is equivalent to ECN 3030.

ECN 3140 Introduction to Statistics for Master of Science Students 4 QH

Introduces statistical methods and techniques used in economic analysis. Topics include descriptive statistics, time-series and index number problems, sampling problems, probability theory, and hypothesis testing. This course is equivalent to ECN 3040.

ECN 3150 Microeconomic Policy Planning Seminar 4 QH

Explores cost efficiency and effectiveness, assessment of externalities, shadow prices, benefit-cost analysis, project implementation and evaluation. Discusses budget analysis, evaluation of public programs, role of private and public sectors, relationship of projects and macro planning, and the use of analysis by policymakers. *Prereq.* ECN 3110, ECN 3140 co-requisite.

ECN 3151 Macroeconomic Policy Planning Seminar

Examines the role of public sector in the economy. Investigates socio-economic objectives and public policies, and national economic planning and synthesis of models for growth and development. Presents the tools and techniques for economic planning, and reviews the construction and utilization of input-output tables. Describes planning and policy implementation and evaluation. *Prereq.* ECN 3120, ECN 3140 co-requisite.

ECN 3152 Workshop in Economic Planning and Policy

Includes empirical work involving micro and macro planning techniques, applying the latter to individual case studies of a specific plan, program, or organization. Students are expected to prepare and present a research paper on a chosen case study, demonstrating the ability to use planning techniques. *Prereq.* ECN 3150 and ECN 3151.

ECN 3210 Microeconomic Theory 4 QH

Presents microeconomic theory at the MA level. Investigates equilibrium conditions in consumption and production and the theory of factor markets and efficiency. Various types of market structures are covered with respect to these areas. *Prereq.* ECN 3030 or ECN 3130.

ECN 3220 Macroeconomic Theory 4 QH

Examines basic macroeconomic modeling and policy effectiveness. Focuses on theoretical debate on price level and output determination from the monetarist, Keynesian, and rational expectations viewpoints. *Prereq.* ECN 3030 or ECN 3130.

ECN 3230 History of Economic Thought

Discusses the development of economic thought, focusing on the analytical innovations in economic thought, beginning with the physiocrats and extending up to contemporary thinkers. Stresses the persistence of certain topics, like money, capital accumulation, macroeconomic stability and value theory, throughout the development of economic thought and considers the historical policy issues that inspired different thinkers to address these topics in a new way.

ECN 3240 Statistical Inference**4 QH**

Studies statistical methods and techniques. Topics include probability theory and models, testing economic hypotheses, analysis of variance, estimation, non-parametric tests, t-statistics and f-statistics, and correlation analysis. *Prereq. ECN 3040 or ECN 3140 or statistics examination.*

ECN 3241 Econometrics 1**4 QH**

Studies the classical linear model of estimation, testing and prediction. Explores the implications and solutions of multicollinearity, heteroscedasticity, and autocorrelation. Topics include qualitative variables, discrete dependent variables, dynamic models, simultaneous equation systems, instrumental variables estimation, and model selection. *Prereq. ECN 3030, ECN 3130, and ECN 3240.*

ECN 3310 Case Studies in Applied Microeconomics

Explores applied microeconomics using case studies in organizational decision-making for such problems as short- and long-run forecasting of demand, and short- and long-run cost and production decisions. Other case studies focus on competition and pricing strategies in different markets, financing of investments, and response to government regulations and taxation. *Prereq. ECN 3010 or ECN 3110, ECN 3030 or ECN 3130.*

ECN 3315 Economics of Law and Public Policy

Builds on a knowledge of intermediate microeconomic theory in evaluating the justification for an impact of various bodies of law and public policy. While the particular examples and focuses may vary, the emphasis of the course will be on economic justifications for government intervention; public policy alternatives; and impact evaluation of alternative government policies. Discussions will rely on economic models of behavior and social welfare theory to describe and predict the impact of law/regulation/policy and to evaluate alternative forms of intervention. Topics include the element of an economic perspective, unregulated market behavior, market failure and public intervention, policy and program evaluation, and the economics of contract and tort law. Limited to Law, Policy, and Society students, with exceptions by permission of the instructor. *Prereq. ECN 3010 or permission of instructor.*

ECN 3330 Economic Programming

Examines economic programming with an emphasis on linear programming, simulation, and queuing theory with computer applications. *Prereq. ECN 3530.*

ECN 3332 Computers in Economic Research

Introduces the use of computers in economic research. Topics include using the Northeastern computer system, descriptive statistics, regression analysis, matrix manipulation, and high-level programming languages. This course will combine classroom lectures with hands-on use of the computer. *Prereq. ECN 3040, ECN 3140, or ECN 3240.*

ECN 3350 Economics of the Labor Market and Labor Force 1

Presents labor force measurement and determinants, participation and composition, and microanalysis of labor supply and demand. Topics also include varieties of labor markets and their functioning, labor allocation and migration, minimum wages, and applications of human capital theory to the labor force. *Prereq. ECN 3010 or ECN 3110.*

ECN 3351 Economics of the Labor Market and Labor Force 2

Studies macro money-wage and employment determination in the short run, the Phillips curve, and macro wage-price problems. Discusses income policies, unemployment and underemployment, technological change, and changing skill requirements. Includes productivity measures, determinants and trends, and secular changes in real wages and employment. *Prereq. ECN 3020 or ECN 3120.*

ECN 3352 Economics of Manpower Planning 1

Examines the role of manpower planning and its integration with general development planning. Analyzes and evaluates different techniques of manpower planning, including technological versus economic methods. Offers practice in manpower forecasting and data problems, and skill training versus educational strategies. Explores models of educational planning and their applications to different countries. *Prereq. ECN 3010 or ECN 3110.*

ECN 3353 Economics of Manpower Planning 2

Presents applications of manpower planning methods and techniques to problems of national economic development. Considers cost-benefit and cost-effectiveness of educational and manpower programs. Focuses on the special problems of health manpower, scientists, engineers, and technicians. Evaluates methods and predictions used in national manpower plans. *Prereq. ECN 3352.*

ECN 3354 Economics of Medical Care

Discusses the organization of medical care, the problems associated with various alternative delivery systems, and the utilization and availability of physicians and other paramedical personnel. Examines the growth and pressures exerted by third-party payers; and consideration of federal, state, and municipal participation in the delivery of quality medical care under various alternatives for national health insurance.

ECN 3355 Economics of Human Capital

Examines the investments in human capital as applied to education, training, health, migration, family formation, and fertility. Uses empirical studies to illustrate human capital theory and to evaluate its usefulness in both developed and developing economies.

ECN 3356 Local Labor Markets: Research Methods, Problems, and Planning

Studies analytical frameworks and empirical measures for determining the nature and operation of state and local labor markets. Analyzes techniques for planning human resource programs at state and local levels. Discusses a variety of local labor markets, the use of data from public agencies to examine such markets, and composition of local labor force. Topics also include sources of local labor supply, industrial and occupational mix, local wage and salary structures, and local income distribution.

ECN 3359 Seminar in Human Resource Development

Presents selected topics on the development and use of human resources. *Prereq.* *Permission of instructor.*

ECN 3360 Regional Economics

Explores determinants of homogeneous regions, including theories of location for firms, industries, and people. Considers regional income accounting systems, and models of intra- and interregional income and output; economic impact analysis. *Prereq.* *ECN 3010 or ECN 3110.*

ECN 3362 Economics of Crime

Discusses the resource allocation problem as it relates to criminal behavior and effective law enforcement. Evaluates costs and benefits of alternative law enforcement policies. Analyzes criminal activity, including organized crime in an economic context.

ECN 3363 Urban Economic Systems

Considers the economy of cities. Analyzes intrametropolitan spatial relationships including industrial location, and models of residential land, and housing markets. *Prereq.* *ECN 3010 or ECN 3110 and ECN 3030 or ECN 3130.*

ECN 3364 Urban Economic Development

Investigates problems in urban economic development. Topics include: dynamic and structural change in urban economics, models and techniques for describing and evaluating urban economies, development strategies and tools, commercial and industrial development, and housing development. *Prereq.* *ECN 3010 or ECN 3110.*

ECN 3366 Economics of Transportation

Provides an application of microeconomic theory to transportation. Topics include: demand and demand estimation, cost and cost estimation, pricing and investment, and regulation and deregulation. Applications cover both urban and intercity passenger transportation as well as freight transportation. *Prereq.* *ECN 3010 or ECN 3110 and ECN 3030 or ECN 3130.*

ECN 3369 Urban/Regional Economics Seminar

Covers selected topics in urban/regional economics. *Prereq.* *ECN 3363 or ECN 3364.*

ECN 3370 Economic Development Theory

Presents alternative approaches to the theory of economic development. Considers theories that address growth, technology, structural change, industrialization, factor proportions and factor prices, trade, popu-

lation, and income distribution. *Prereq.* *ECN 3010 or ECN 3110, ECN 3020 or ECN 3120 or permission of instructor.*

ECN 3371 Regional Development

Examines methodology and applications of input-output techniques for planning and analysis in developing countries. Discusses national and multiregional input-output systems. *Prereq.* *ECN 3332 or permission of instructor.*

ECN 3372 Comparative Economic Development

Explores methods and applications of comparative development study, measures and indicators of development, cross-country data analysis, comparative development systems plans vs. markets, and comparative development strategies. *Prereq.* *ECN 3370 or permission of instructor.*

ECN 3373 Development Finance

Examines sources of investment finance in developing countries; role of taxation and tax structure reform; development of financial institutions and capital markets; private and official finance from abroad and debt-service problems; and problems of monetary management and export instability.

ECN 3374 Comparative Economic and Business Practices in the United States and Abroad

Covers market structure and business organization, ownership, management and control in the United States, OECD, and other developed countries; the influence of multinational enterprises. Studies labor markets and survey and case studies of industrial relations. Traces patterns and impact of government policies and national trade and finance patterns, volume, and practices.

ECN 3375 International Trade and Finance

Focuses on classical and neoclassical theories of international trade, balance of payments, exchange rate determinants, analysis of trade distortions, international financial markets, the international monetary system, and issues in international trade and finance. *Prereq.* *ECN 3010 or ECN 3110 and ECN 3020 or ECN 3120.*

ECN 3379 Development Planning Seminar

Analyzes political and economic plans. Surveys neoclassical growth economies, and input-output techniques in open and closed models. Covers elements of linear programming; optimal decision techniques; processes of implementation of planning; interaction of public and private sectors; and guide to empirical applications. *Prereq.* *ECN 3020 or ECN 3120 or ECN 3220 and ECN 3370 or permission of instructor.*

ECN 3380 Monetary Theory

Studies the relationships between money and economic activity emphasizing various quantity theory models and theories of the demand for money and velocity. *Prereq.* *ECN 3020 or ECN 3120.*

ECN 3381 Monetary Policy

Analyzes monetary policy in the United States. Studies Federal Reserve objectives, policy instruments and techniques and their relationship to aggregate eco-

conomic activity and financial markets. Introduces recent developments and issues. *Prereq.* ECN 3880.

ECN 3384 Capital Markets

Covers primary sources of savings and demand for financial assets; role of financial intermediaries; banking system; and government lending agencies. Explores demand for funds and real investment—mortgage, corporate, and government securities markets; interdependence of rate structures; and flow-of-funds data in relation to national income accounts.

ECN 3389 Seminar in Money and Finance

Selected topics in money, credit and banking. Students will write research papers. *Prereq.* Permission of instructor.

ECN 3390 Public Finance Theory 1: Public Expenditures

Surveys fiscal functions and institutions of government; public choice and fiscal politics; theory of public goods; public expenditure analysis and evaluation; and fiscal federalism and relationships among governments at different levels, including intergovernmental grants. *Prereq.* ECN 3010 or ECN 3110 and ECN 3030 or ECN 3130.

ECN 3391 Public Finance Theory 2: Taxation

Focuses on fiscal functions of government; principles of taxation; problems of tax structure and reform at the national and local levels; tax incidence and equity; effects of taxation on economic efficiency and growth; and issues of public debt and the deficit. *Prereq.* ECN 3010 or ECN 3110.

ECN 3392 Public Policy and Finance

Studies techniques of fiscal policy, fiscal policy norms, and public sector debt; tax policy and federal tax reform; the conflict between social implications of price stabilization and full employment; public expenditure policy; and the interrelation between monetary and fiscal controls. *Prereq.* ECN 3020 or ECN 3120.

ECN 3399 Seminar in Public Finance

Presents selected topics in public finance. *Prereq.* ECN 3390 and ECN 3391 or permission of instructor.

ECN 3510 Microeconomic Theory 2 4 QH

Examines advanced topics in microeconomics related to consumption, production, and market imperfections. Analyzes theory of general equilibrium, welfare economics, second best, externalities, and public goods. *Prereq.* ECN 3210 or equiv.

ECN 3520 Macroeconomic Theory 2 4 QH

Studies theory and problems of macro-dynamics, growth, inflation, cycles, and stabilization policy. *Prereq.* ECN 3220 or equiv.

ECN 3530 Mathematics for Economics 4 QH

Applies matrix algebra and simple multivariate calculus to economic analysis. Discusses static optimization and dynamic analysis; difference and differential equations. Uses examples from economic theory. *Prereq.* ECN 3030 or ECN 3130 or mathematics examination.

ECN 3540 Econometrics 2 4 QH

Examines asymptotic and small sample properties of various estimators; rank-order conditions for identification;

specification error and error in variables; remedies for autocorrelation and multicollinearity; dummy variables; distributed lags; forecasting and simulation; non-linear estimation; and alternative estimation technique. *Prereq.* ECN 3241.

ECN 3601 Doctoral Research Seminar 1 4 QH

The PhD seminars are taken after all required PhD courses have been completed. *Prereq.* ECN 3510, ECN 3520, ECN 3530, ECN 3540 (the PhD core), and 12 QH of graduate coursework in the student's field of concentration, or by written permission of instructor.

ECN 3602 Doctoral Research Seminar 2 4 QH

Prereq. ECN 3601.

ECN 3798 Master's Thesis Continuation 0 QH

ECN 3799 Doctoral Dissertation Continuation 0 QH

ECN 3850 Internship in Economics 1 QH

Comprises academic credit for internship work in economics. For MA or MS students only. *Prereq.* Permission of instructor and approval of graduate director.

ECN 3851 Internship in Economics 2 QH

Comprises academic credit for internship work in economics. For MA or MS students only. *Prereq.* Permission of instructor and approval of graduate director.

ECN 3852 Internship in Economics 3 QH

Comprises academic credit for internship work in economics. For MA or MS students only. *Prereq.* Permission of instructor and approval of graduate director.

ECN 3855 Internship in Economics 1 QH

Comprises academic credit for internship work in economics. For PhD students only. *Prereq.* Permission of instructor and approval of graduate director.

ECN 3856 Internship in Economics 2 QH

Same as ECN 3855.

ECN 3857 Internship in Economics 3 QH

Same as ECN 3855.

ECN 3870 Readings in Economics 1 QH

Offers supervised reading in selected topics in economics. For MA or MS students only. *Prereq.* Permission of instructor and approval of graduate director.

ECN 3871 Readings in Economics 2 QH

Offers supervised reading in selected topics in economics. For MA or MS students only. *Prereq.* Permission of instructor and approval of graduate director.

ECN 3872 Readings in Economics 3 QH

Offers supervised reading in selected topics in economics. For MA or MS students only. *Prereq.* Permission of instructor and approval of graduate director.

ECN 3873 Readings in Economics 4 QH

Offers supervised reading in selected topics in economics. For MA or MS students only. *Prereq.* Permission of instructor and approval of graduate director.

ECN 3874 Readings in Economics 5 QH
Offers supervised reading in selected topics in economics. *For MA or MS students only. Prereq. Permission of instructor and approval of graduate director.*

ECN 3875 Readings in Economics 6 QH
Offers supervised reading in selected topics in economics. *For MA or MS students only. Prereq. Permission of instructor and approval of graduate director.*

ECN 3880 Readings in Economics 1 QH
Offers supervised reading in selected topics in economics. *For PhD students only. Prereq. Permission of instructor and approval of graduate director.*

ECN 3881 Readings in Economics 2 QH
Offers supervised reading in selected topics in economics. *For PhD students only. Prereq. Permission of instructor and approval of graduate director.*

ECN 3882 Readings in Economics 3 QH
Offers supervised reading in selected topics in economics. *For PhD students only. Prereq. Permission of instructor and approval of graduate director.*

ECN 3883 Readings in Economics 4 QH
Offers supervised reading in selected topics in economics. *For PhD students only. Prereq. Permission of instructor and approval of graduate director.*

ECN 3884 Readings in Economics 5 QH
Offers supervised reading in selected topics in economics. *For PhD students only. Prereq. Permission of instructor and approval of graduate director.*

ECN 3885 Readings in Economics 6 QH
Offers supervised reading in selected topics in economics. *For PhD students only. Prereq. Permission of instructor and approval of graduate director.*

ECN 3890 Master's Thesis 6 QH
Provides thesis supervision by members of the department. *Prereq. Approval of graduate director.*

ECN 3899 Doctoral Dissertation 0 QH
Prereq. Approval of graduate director.

English

Students in graduate programs other than English and Curriculum and Instruction may register for English department courses only in the first week of classes and only with the permission of the instructor.

All courses carry three quarter-hours of credit unless otherwise specified.

ENG 3300 Introduction to Critical Issues
Presents approaches to the study of literature considering both traditional and contemporary views.

ENG 3302 Bibliography and Research Methods
Investigates the methods of finding information in the study of literature and language. Explores primary bibliography, secondary bibliography, and textual and critical bibliography. Examines how to research, write, and document papers for graduate seminars, how to research and write theses and dissertations, and how to publish articles and books. This course is strongly recommended for all students who plan to study for a PhD in English.

American Literature

ENG 3324 Perspectives on American Literature
Attempts to discover common themes and recurrent patterns in American literature through a close reading of critics as various in their approaches as Lawrence, Parrington, Chase, Pearce, and Fiedler.

ENG 3325 Topics in Early American Literature
Focuses on the work of one writer, a group of writers, or a theme or structure common to several writers—Jonathan Edwards, women writers, the poets of the seventeenth and eighteenth centuries, or polygamy, for example—in the first two hundred years of American literature. Topics change with time and demand.

ENG 3326 Topics in Twentieth-Century American Literature
Explores twentieth-century American literature on a thematic, formal, generic, cultural, or interdisciplinary basis. May include topics such as: heroes and antiheroes in modern American fiction, twentieth-century American nature poetry, action painting and the New York School, women in twentieth-century American literature, surrealism in modern and contemporary American poetry, the city in twentieth-century American literature, and naturalism in the modern American novel.

ENG 3327 Major American Novelist
Examines in detail the work of a major American novelist and its historical context and cultural milieu—the work, for example, of Herman Melville, Mark Twain, Henry James, Willa Cather, Ernest Hemingway, or Saul Bellow.

ENG 3328 Major American Playwright
Examines in detail the work of a major American playwright and its theatrical style and social impact—the work, for example, of Eugene O'Neill, Tennessee Williams, Arthur Miller, or Edward Albee.

ENG 3329 Major American Poet
Considers in depth the work of a single major figure. Some likely subjects are Whitman, Dickinson, Frost, Eliot, Pound, Williams, Stevens, and Lowell.

ENG 3330 American Drama
Surveys American drama from its political beginnings in the eighteenth century to the experimental variety

of the twentieth, from Royall Tyler and William Dunlap to Eugene O'Neill and Imamu Amiri Baraka.

ENG 3331 Topics in American Literature

Presents American literature on a thematic, formal, generic, cultural, or interdisciplinary basis. May include: the *Isolato* in American literature, typology and American art, written women and women writers, realism in American literature, Southern literature, humor in American literature, the frontier in American writing, local colorists, and "The Machine in the Garden."

ENG 3583 Early American Literature

Surveys American literature during its first two centuries, from the Puritans to the Knickerbockers, from William Bradford to James Fenimore Cooper.

ENG 3585 Topics in Nineteenth-Century American Literature

Topic to be announced. Recent examples include Transcendentalism, the literature of the Civil War, and the literature of social reform.

ENG 3586 Nineteenth-Century American Prose, 1820-1865

Focuses on the characteristics of the Romantic movement and New England Transcendentalism as we find them in the works of the principal prose writers of the period. Determines the particular themes and techniques of such writers as Poe, Hawthorne, Melville, Emerson, and Thoreau by close readings of their texts.

ENG 3587 Nineteenth-Century American Poetry

Topic to be announced.

ENG 3589 Nineteenth-Century American Prose, 1865-1900

Covers the post-Civil War novel in America, including the realistic and naturalistic movements, and such authors as Twain, Howells, and Henry James. Includes some notable nonfiction writers, such as Henry Adams and William James.

ENG 3592 Modern American Drama

Analyzes philosophic and aesthetic trends among such playwrights as O'Neill, Williams, Miller, Albee, Simon, and others.

ENG 3593 Individual Modern American Poet

Topic to be announced.

ENG 3594 Contemporary American Prose

Concentrates on the novel in exploring developments in American prose since 1945. Considers Mailer, Bellow, Malamud, Barth, Heller, Walker, Pynchon, Vonnegut, and Hawkes.

ENG 3595 Individual Modern American Novelist

Examines in depth the work of a major figure in American fiction, focusing on the cultural context out of which he or she emerges. Recent selections for this course have been Hemingway, Fitzgerald, Mailer, Faulkner, and Bellow.

ENG 3596 Individual American Writer

Topic to be announced.

ENG 3598 Modern American Prose

Includes close examination of such prose forms as the essay, short story, autobiography, biography, history, and novel. May select writers with some special

purpose in view, but those generally representative of the 1912-1950 period.

ENG 3610 Contemporary American Fiction

Surveys major developments in American fiction of the period from roughly 1945 to the present against the cultural background of that period. Considers such categories as Southern fiction, Jewish fiction, black fiction, women's fiction, and such writers as Mailer, Kerouac, Welty, Malamud, and Didion.

British Literature

ENG 3416 Twentieth-Century British Drama

Explores the evolution of British drama from Shaw to Tom Stoppard, giving particular attention to the influence of Ibsen and later European dramatists; the Irish influence of Yeats, Synge, and O'Casey; the traumas of two world wars; and the steady growth in the variety and power of British dramatic productions. Also studies Arthur Wing Pinero, John Galsworthy, D. H. Lawrence, Samuel Beckett, James Osbourne, Terrence Rattigan, and Harold Pinter.

ENG 3548 Topics in Renaissance Literature

Considers specific topics in the literature of the sixteenth century, such as the sonnet sequence, and fictional and nonfictional prose.

ENG 3549 Topics in Seventeenth-Century Literature

Considers specific topics in literature from 1600 to approximately 1660, such as metaphysical poetry, religious poetry and prose, and drama.

ENG 3551 Chaucer

Examines in detail selected works by Chaucer.

ENG 3553 Medieval Literature

Examines in detail major works of medieval literature.

ENG 3554 Topics in Medieval Literature

Topic to be announced.

ENG 3555 Renaissance Literature

Studies non-dramatic works by such authors as Wyatt and Surrey, Sidney, Marlow, Spenser, and Shakespeare.

ENG 3558 Shakespeare's Tragedies

Studies Shakespeare's major tragedies.

ENG 3559 Shakespeare's Comedies

Studies Shakespeare's major comedies.

ENG 3560 Topics in Shakespeare

Topic to be announced.

ENG 3561 Seventeenth-Century Literature

Covers major prose and poetry of the seventeenth century, excluding drama: Bacon, Hobbes, Browne, Bunyan, Donne, Herbert, Johnson, Marvell, and others.

ENG 3562 Milton

Presents Milton's poetic and intellectual achievement through analysis of his major works. Emphasizes *Paradise Lost* as an expression of Renaissance humanism and the culmination to the epic tradition.

ENG 3563 Restoration and Early Eighteenth-Century Literature

Critically studies neoclassical drama, poetry, and criticism, including Restoration drama, Dryden, Pope, Addison, Steele, and Gay.

ENG 3564 Later Eighteenth-Century Literature

Considers Johnson, Boswell, and the Club: Burke, Goldsmith, and Gibbon. Includes poetry of Cowper, Gray, Burns, and Smart.

ENG 3565 Topics in Eighteenth-Century Literature

Topic to be announced.

ENG 3566 Eighteenth-Century Novel

Focuses on novels by Defoe, Fielding, Richardson, Smollett, Sterne, and Austen.

ENG 3568 Romantic Poetry

Surveys representative forms and works of the major poets of the English Romantic Period (1798-1832): Blake, Wordsworth, Coleridge, Byron, Shelley, and Keats. Studies the poetry in the historical and intellectual context of its time.

ENG 3569 Romantic Literature

Surveys representative forms and work of English Romantic prose—both fiction and nonfiction. Draws examples from the fiction of Austen, Hogg, Scott, and the Gothic novelists, as well as from the nonfiction prose of Coleridge, De Quincey, Hazlitt, Lamb, and Shelley. May use other texts as needed to illustrate or amplify the ideas expressed in the prose.

ENG 3570 Topics in Romanticism

Explores Romantic attitudes toward mankind in relation to self, society, and the universe, and Romantic attitudes toward the individual person as poet, with the impact these attitudes have upon the form and thematic substance of authentic and fictional autobiography in poetry and prose. May include an intensive reading of one major British writer whose attitudes, themes, style, and philosophy are representative of the Romantic Era (1798-1832).

ENG 3571 Victorian Literature

Surveys major genres in Victorian literature with emphasis on the transition from the Victorian to the "modern," including such writers as Carlyle, Ruskin, Arnold, Swinburne, Pater, and Wilde.

ENG 3572 Victorian Poetry

Focuses on Tennyson, Browning, Arnold, the pre-Raphaelite circle, and the movement toward modernism: D. G. Rossetti, Swinburne, G. M. Hopkins.

ENG 3573 Victorian Novel

Closely studies major works by such writers as Dickens, Eliot, the Brontës, and Hardy.

ENG 3575 Topics in Victorian Literature

Topic to be announced.

ENG 3580 Twentieth-Century British Fiction

Examines major figures of the modern and the contemporary periods: Conrad, Joyce, Cary, Beckett, Braine, Fowles, Snow, Lawrence, Woolf, Murdoch, Lessing and Huxley.

ENG 3582 Topics in Irish Literature

Examines such topics as the Irish Renaissance, Irish short fiction, and the Irish novel.

ENG 3628 Topics in Twentieth-Century British Literature

Explores various topics in twentieth-century British literature.

Creative Writing**ENG 3347 Creative Writing Workshop**

Comprises advanced work in creative writing. *Prereq.* ENG 3350, ENG 3351 or permission of instructor.

ENG 3350 Creative Writing 1

Focuses on prose fiction.

ENG 3351 Creative Writing 2

Focuses on poetry.

ENG 3605 Independent Study in Creative Writing

By arrangement.

ENG 3606 Creative Writing Thesis

6 QH

By arrangement.

Criticism**ENG 3315 Contemporary Critical Theory**

Introduces the study of modern and contemporary literary theory and criticism, including "New Critical," Marxist, feminist, psychoanalytic, structuralist, poststructuralist, phenomenological, and other approaches.

ENG 3317 Topics in Criticism

Examines such topics in critical theory as narrative, cultural criticism, representation, reader response, and feminist theory.

ENG 3320 History of Criticism

Studies the history of literary criticism from Aristotle to the present including such writers as Aristotle, Plato, Sidney, Johnson, Wordsworth, Shelley, and Pater.

Film Studies**ENG 3612 Film Studies**

Introduces the basic methods of film analysis, the history of cinema, and recent theoretical debates within film studies. Provides familiarity with ways of analyzing films in terms of editing, shot composition, framing, mise-en-scene, and the like, with the historical changes in Hollywood and in international cinema, and with such current theories as structuralism and semiotics.

ENG 3613 Topics in Film

Focuses on some specific dimension of film studies—a genre of film such as film noir, a director like Alfred Hitchcock or Francis Ford Coppola, a film movement like Expressionism or social realism, or a particular historical moment in film history such as post-1967 Hollywood. Topics chosen determine texts and films.

Independent Studies

ENG 3601 Thesis

6 QH

ENG 3602 Independent Study

By arrangement.

ENG 3603 Independent Study Certificate of Advanced Graduate Study

By arrangement. *Limited to students in the Certificate of Advanced Graduate Study Program.*

Linguistics

ENG 3321 Linguistics and Literature

Introduces stylistics, the study of formal properties of poetry and prose. Considers general questions: Are there constraints on creativity? What relationship holds between form and meaning? What is the nature of metaphor? How can we characterize author style, genre style? Analyzes texts of representative major writers for linguistic features. Focuses on how linguistic methods can contribute to critical response.

ENG 3322 Linguistics and Writing

Explores topics in textuality and text cohesion, distinguishing unified text from a string of unrelated sentences. Studies lexical, semantic, and syntactic cohesion, paragraph patterning, and information flow. Analyzes diverse non-fictional prose selections for discourse style features. Considers expressive, persuasive, and reference discourse (scientific, informative, and exploratory modes).

ENG 3400 Issues in English Grammar

Explores the nature and rules of grammar. Examines and enlightens concepts and definitions in traditional grammar using tools from contemporary linguistic theory. Contrasts the role of rules as prescriptive conventions or descriptive devices. Considers how sentence structure contributes to meaning in language. Examines the relationship between grammar and dialect, question of standard and nonstandard English, and notions of linguistic competence and linguistic performance.

ENG 3401 Introduction to Semantics

Examines how language constructs meaning. Explores various linguistic levels where meaning resides: word, sentence, intonation, stress, and discourse. Considers non-linguistic factors affecting meaning: context, pragmatic knowledge, and the rules of logic. Investigates such questions as: What are the minimal units of meaning? What elements go into determining meanings? Are there any meaning universals? Are meanings fixed?

ENG 3402 History of English Language

Traces the development of English using linguistic readings and historical documents (letters, journals, literary selections) from various periods and representing a range of styles (formal to informal). Studies changes in the sound system, inflectional system,

vocabulary, and syntax of English, as well as the development of prose style. Considers issues in language change: the influence of foreign invasion, relocation, dialect dominance, and literacy; and specific events such as the Norman invasion and the settlement of America.

ENG 3403 Topics in Linguistics

Explores such issues in linguistics as the lexicon; dialect; metaphor; language and gender; and language and social structure.

ENG 3404 Introduction to Linguistics

Poses the question "What is language?" and takes both an internal and external approach to an answering. Examines the internal organization of linguistic units (phonemes, morphemes, phrases, sentences) in languages as diverse as Arabic, Breton, Xhosa, and Zuni. Discusses how language is learned and used, exploring biological, computational, philosophical, and social facets. Introduces a linguistic perspective on topics of language controversy, including literacy, sexism, language change, and the "innateness question."

ENG 3406 Introduction to Syntax

Explores aspects of language structure through the framework of contemporary syntactic theory. Offers a technical but introductory exploration of the form, function, and relationships of words, phrases, clauses, and sentences. Introduces tools of linguistic analysis and a methodology for examining our internalized knowledge of English sentence composition. Considers language from the perspective of learnability and universal grammar.

Literary Studies

ENG 3358 Topics in Nonfiction Prose

Examines writings in nonfiction prose in such areas as biography, history, science, and technology. Varies according to the design of the instructor.

ENG 3361 Topics in Literary Study

Focuses on literature on a thematic, formal, or generic basis. May include: black women writers, poetry of nature.

ENG 3419 Topics in Genre

Examines such topics in genre criticism as biography, autobiography, satire, and children's literature.

ENG 3420 Contemporary Poetry

Surveys technical and thematic developments of contemporary (including postmodern) American and British poetry. Considers such writers as Bishop, Lowell, Larking, Jennings, Hughes, Heavey, Ashbery, Bronk, Ginsberg, Plath, Rich, Baraka, O'Hara, Tomlinson, Hill, Bly, Merwin, and Merrill. Considers also more "current" writers such as Palmer, Schnackenberg, and Hass, as well as such groups as the L=A=N=G=U=A=G=E poets, and such practices as performance poetry and field composition.

ENG 3421 Modern Poetry

Surveys technical and thematic developments of modern American and British poetry. Considers such writers as Yeats, Frost, Stevens, Eliot, Pound, H. D.,

Sitwell, Moore, Williams, and Auden. Considers also such issues as canon formation and such "movements" as the Harlem Renaissance, as well as the intersections of modernism and postmodernism.

ENG 3622 Topics in Drama

Examines such subjects as tragic drama, comic drama, and absurdist drama.

ENG 3623 Topics in Poetry

Examines such subjects as epic poetry, the lyric, poetry of the seasons, and confessional poetry.

ENG 3624 Topics in Fiction

Examines such subjects as short fiction, the romance, and the short-story cycle.

ENG 3625 Topics in Literary Relations

Explores relations among national literatures. Covers such subjects as Modernism in England and America, and Romanticism in nineteenth-century England and America.

ENG 3626 Topics in Literature and Other Disciplines

Examines such subjects as literature and the visual arts, literature and psychology, and literary impressionism.

ENG 3627 Topics in Comparative Literature

Examines such subjects as classical backgrounds, nineteenth-century European novel, and post-Modernist fiction.

Technical Writing

ENG 3348 Materials and Methods for Technical Writing

Allows students to research a variety of topics that are germane to teaching, corporate training, and improving one's own technical writing skills. Explores sources of information available to scientific and technical communications, including on-line databases, conventional printed sources, and personnel. *Students should plan to take this course early in their graduate studies.*

ENG 3349 Workshop in Writing for Publication

Examines published articles in scientific, technical, and professional journals and magazines, articles that will be evaluated for content, style, tone, format, and mechanical details. Analyzes the articles success, its professionalism, its appropriateness and timeliness, and the professional standards of the journal. Provides for students to research, write, and revise an article for submission to a professional journal of their choice, and for the class to review and edit these articles before submission. Aims at having an article accepted for publication.

ENG 3352 Writing for the Professions

Offers an intensive seminar to professionals who need to compose effective letters, memos, proposals, and reports. Focuses on practical approaches to clear, concise writing in fields such as business, marketing, and medicine. Emphasis varies each quarter.

ENG 3354 Technical Writing

Concentrates on communicating scientific and technical information to a variety of audiences. Provides practice in the different aspects of the technical process: analyzing the project, gathering information, organizing, designing layout and graphics, writing, revising, and using feedback. Offers opportunities to write several forms of technical communication: proposals, memos, short pieces, and oral presentations, as well as a long technical report. *This introductory level course is a recommended prerequisite for all other courses. Limited to students in the Master of Technical and Professional Writing Program.*

ENG 3355 Topics in Technical Writing

Focuses on specialized topics in professional communication, such as electronic documentation, proposals, and medical writing. Topic varies each quarter.

ENG 3356 Technical Writing Theory and Practice

Examines systematically various theoretical approaches to technical writing as discourse and discipline. Differentiates the aesthetics of technical writing from other forms of discourse through critical analysis of professional writing strategies, based on current theory and research. Allows students to put theory into practice by writing a technical document and a document exploring theoretical issues.

ENG 3365 Professional Presentations

Provides technical and professional writing students with the ability and understanding to make effective professional presentations. Surveys oral communication skills and compares them with written communication skills. Evaluates other types of presentations for their usefulness in technical communication.

ENG 3366 Ethics of Technical and Professional Communication

Explores various philosophical and ethical issues inherent in the practice of technical communication. Takes the position that writing is a political act and considers the questions of ethics and values likely to arise for technical communicators in the course of their work. Expects readings to lay an interdisciplinary foundation for exploring these questions, drawing on the principles of philosophy, semantics, rhetoric, pragmatics, and psychology. Aims to prepare students for long-term careers as humanists in a technological environment.

ENG 3367 Publications Management

Introduces students to the principles of publications management, covering the five topics of design, writing, editing, production, and evaluation. Covers the techniques as well as the principles of publication, design, and production, with emphasis on current technologies used to prepare in-house documents. Emphasizes the problem of matching form and style to audience. Includes a site visit to observe a large in-house production facility. Anticipates students collaboration in small groups to plan, write, and produce a major document.

ENG 3368 Writing for the Computer Industry

Provides the opportunity to write and edit professional-quality computer documentation. Begins with basic instruction sets, increases in difficulty, and prepares students to write a user's guide as a major project for the quarter. Includes a more abstract paper examining trends within the computer industry. Focuses on techniques for creating *readable* documentation, including attention to formatting, graphic design, and text organization. No exams.

ENG 3369 Graphic Design for Technical Writers 1

Introduces the fundamentals of graphic design communication. Covers the basics of typography, illustration, photography, color, and layout techniques through lectures, presentations, class discussions, and assignments/critiques. Presents an overview of the creative and production processes as well as an explanation of the basic tools and terminology needed to effectively communicate with print design and production professionals.

ENG 3370 Technical and Scientific Editing

Explores the fundamentals of editing as they apply to science, technical, and engineering writing. Covers the role of the editor in business, industry, and the sciences; basic editorial services such as copy and content editing, production editing, and project editing; the editor as writer and interviewer; and science interpretation and technical translation.

ENG 3371 Pascal for Technical Writers

Introduces Pascal, emphasizing writing structured programs using loops, decision statements, procedures, and functions. Data types include integer, real, char, boolean, and one- and two-dimensional arrays.

ENG 3372 Graphic Design for Technical Writers 2

Considers the specifics of project management and working with design and production professionals in a non-studio course. Includes an analysis of the roles and responsibilities of writers, editors, designers, illustrators, photographers, production artists, typesetters, printers, and other professionals involved in book design and production. Covers budget considerations, scheduling, and manufacturing processes related to publishing. *Prereq.* ENG 3369 or permission of instructor.

ENG 3604 Independent Project, Technical, and Professional Writing

Provides for preparation of portfolio of technical and professional writing done for final project. *Limited to students to Master of Technical and Professional Writing Program.*

ENG 3621 "C" Programming for Technical Writers

Teaches the basic concepts of "C" to students in the Master of Technical and Professional Writing Program. Covers use of the vi editor, data types, assignment statements, looping, conditional statements, functions, arrays, structures, pointers, and operations on bite.

Technical Writing Training Program**ENG 3614 Principles of Technical Writing**

Introduces the student in the Technical Writing Training Program to the fundamental concepts and principles of technical writing. Includes the definition of technical writing, audience analysis, organization, clarity, and definitional techniques. Provides practice editing and revising existing documentation. Integrates discussion and sound writing techniques with practice in writing original documentation. *Limited to students in the Technical Writing Training Program.*

ENG 3615 Writing for Computer-Related Industries

Focuses on document preparation and production and on the job environment. Teaches how a documentation department is structured, the phases a document passes through, and how to deal with other departments such as research and development or marketing. Discusses such topics as communication skills, what to expect from other writers and managers, and how to excel within a high tech environment. *Limited to students in the Technical Writing Training Program.*

ENG 3616 Applied Software Writing

Introduces a range of advanced concepts and processes relating to technical documentation. May include text processing, on-line help, preparing indices and cross-references, and documentation bases. *Limited to students in the Technical Writing Training Program.*

ENG 3617 Computer Hardware and Organization

Introduces students in the Technical Writing Training Program to computer hardware components and how they are organized into a computer system, the components of which include disks, magnetic tapes, printers, the CPU, and memory. Teaches data representation, acquaintance with assembly language, and how a computer stores, addresses, and executes instructions. Explains files, including records, fields, and indexed files. Introduces elementary data structures. *Limited to students in the Technical Writing Training Program.*

ENG 3618 Programming in "C"

Teaches structured programming using "C". Stresses correctness, clarity, and reliability of programs. Offers individual guidance in writing programs and access to Northeastern's computer systems for running programs. *Limited to students in the Technical Writing Training Program.*

ENG 3619 Operating Systems and Database Management Systems

Examines components of an operating system and methods of data storage and retrieval. Offers familiarity with copiers, linkers, the supervisor, and database management systems. *Limited to students in the Technical Writing Training Program.*

Writing**ENG 3309 Writing and Learning Across the Curriculum**

Explores in depth how writing may be used to promote thinking and learning across a wide variety of disci-

plines. Intended primarily for high school and college instructors in the humanities, social sciences, and natural sciences. *Usually given only through the Martha's Vineyard Institute on Writing.*

ENG 3310 Writing Programs in Schools and Colleges

Examines both the nature of writing programs in schools and colleges and the issues that curricular changes raise for these institutions. Intended for English teachers on all levels who wish to become composition leaders in their schools. Presupposes extensive coursework in composition theory and practice. *Usually given only through the Martha's Vineyard Institute on Writing.*

ENG 3311 English Prose Style

Explores the development of prose style in English (chiefly expository), from the sixteenth century to the present. Most major authors are represented, from Roger Ascham to James Baldwin.

ENG 3312 Composition Studies

Provides an introduction in theories of composition.

ENG 3313 Theory and Teaching of Writing 6 QH

Examines several premises of writing instruction and how they can provide successful classroom practices. Designed for teachers or prospective teachers of writing in college or the public schools. *Usually given only through the Martha's Vineyard Institute on Writing.*

ENG 3314 Writing and Reading: Composing Processes 6 QH

Offers teachers the opportunity to develop a coherent theory of reading instruction coordinated with their teaching of writing. Restricted to teachers who have previously taken a course in the theory and teaching of writing. *Usually given only through the Martha's Vineyard Institute on Writing.*

ENG 3353 Topics in Writing

Examines various topics in writing and composition.

ENG 3357 Computers and Writing

Explores the two major uses of computers in writing instruction: word processing and computer-assisted instruction. Concentrates on the rudiments of word processing, hands-on experience, classroom exercises, and teaching strategies. Includes demonstrations of prewriting, organizing, and revising software, and strategies for developing CAI in composition, and a brief introduction to a programming language. *Usually given only through the Martha's Vineyard Institute on Writing.*

ENG 3359 Writing Workshop 1

Provides advanced training in varied forms of writing. May include such specialized areas as fiction, poetry, professional writing, and writing for academic administrators. Requires intensive student writing and extensive instructor comment. *Usually given only through the Martha's Vineyard Institute on Writing.*

ENG 3360 Writing Workshop 2

Provides advanced training in varied forms of writing. May include such specialized areas as fiction, poetry, and professional writing for academic administrators.

Requires intensive student writing and extensive instructor comment. *Usually given only through the Martha's Vineyard Institute on Writing.*

ENG 3380 Prose Writing 1

Surveys writing of various types of nonfiction prose, including reviews, reports, biography, commentary, research, personal narrative, travel, and others developed by the participant in consultation with the instructor. Focuses on concepts of content, point of view, organization style, and stages of composition. *Usually given only through the Martha's Vineyard Institute on Writing.*

ENG 3381 Prose Writing 2

Continues ENG 3380. Attempts to reinforce writing theory and practice, to introduce the professional concerns of writers, and to prepare writing for possible publication. Provides for participants to refine techniques of composition and to examine the rhetorical methods of description, narration, exposition, and persuasion. Reviews such writers' markets as newspapers, popular magazines, and scholarly journals. When possible, will feature professional writers as guest speakers. *Usually given only through the Martha's Vineyard Institute on Writing.*

ENG 3382 Responding to Writing

Examines and puts into practical use a variety of methods of analyzing writing. Studies both professional and student writing. Provides the tools for analyzing and improving student writing, assessing the writing of their students, and designing appropriate writing assignments and activities. Provides an opportunity to begin the development of an integrated writing curriculum from the elementary to the college level.

ENG 3383 The Composing Process

Based on the premise that the key to teaching writing is teaching revision strategies. Participants look at the research studies of elementary, secondary, and college students and examine manuscripts of professional writers such as E. B. White. Focuses on both the theory and practice of revising. Covers understanding students' assumptions about the writing/revising process; teaching revision strategies; using student writing to teach revision; responding to student writing within the context of revising; and analyzing personal revision strategies. Explores how participants can use what they know about their own revising strategies to teach revision. *Usually given only through the Martha's Vineyard Institute on Writing.*

ENG 3384 Rhetorical Theory

Traces the history of rhetoric and examines the major contemporary theories in the field. Considers the classical rhetoric of Aristotle, Plato, Cicero, and Quintilian and ends with the modern formulations of rhetoric by I. A. Richards, Philip Wheelwright, Alexander Bain, James Moffett, and James Kinneavy. Examines rhetoric in terms of traditional modes of classifying discourse—description, narration, exposition, and persuasion—as well as modern reclassifications—expressive, referential, literary, and other modes. Re-

views rhetorical strategies for invention in the composing process: Burke's dramatistic method, Rohman's prewriting, and Pike's tagmenics. *Usually given only through the Martha's Vineyard Institute on Writing.*

ENG 3385 Writing about Literature and Other Disciplines

Examines some characteristic student and professional writing in the humanities, sciences, and social sciences. Attempts to help participants see how students can use writing as a way of knowing and learning, not just in the English class but, for example, in the biology, history, or even mathematics class. *Usually given only through the Martha's Vineyard Institute on Writing.*

ENG 3386 Research in Composition

Prepares publication of research by providing a working knowledge of sources, current scholarship, and standards of publication. Acquaints participants with various bibliographies, journals, texts, and monographs that constitute the important documents of the field. Uses these documents to pursue research topics in invention, structure, and form, modes of discourse, the composing process, and pedagogy. *Usually given through the Martha's Vineyard Institute on Writing.*

ENG 3387 Case Study Design

1 QH

Prepares participants for research to be conducted in ENG 3388 during the academic year at the home institution. Examines some published case studies of teaching and writings and explores relevant methods of data analysis, observation techniques, interview and questionnaire construction, sampling procedures, experimental design, and writing protocol analysis. *Usually given only through the Martha's Vineyard Institute on Writing.*

ENG 3388 Fieldwork

4 QH

Allows participants to conduct the independent research planned in ENG 3387. Provides resources available for this research at the home institution, including the participants' individual teaching practices, course or departmental curriculum, the writing of their students and of students in other classes, the practices of other teachers and administrators, as well as published books, reports, and articles on composition. Provides for students to collect, collate, and interpret data according to the guidelines established at the institute and then prepare a project in which they present their findings. *Usually given only through the Martha's Vineyard Institute on Writing.*

ENG 3389 Case Study Analysis

1 QH

Provides for participants who have prepared ENG 3388 projects to present their findings, draw their conclusions, and discuss the implications of their research for further study. Guides participants toward possible publication of their work in relevant composition journals. Concludes the ENG 3387, ENG 3388, and ENG 3389 sequence. *Usually given only through the Martha's Vineyard Institute on Writing.*

ENG 3620 Rhetoric

Introduces students to the ideas and scholarship of the major periods of rhetorical developments and allows students to explore the definition of "rhetoric" in ways most meaningful to individual interests.

History

All courses carry three quarter-hours of credit except seminars, which carry four quarter-hours, and other courses where noted.

HST 3241 Methodology

Explores the objectives, methods, and resources of the historian.

HST 3242 European Historiography

Analyzes the development of historical writing from ancient times to the present.

HST 3243 American Historians

Covers the writing of American history by Americans, from colonial times to the present, with emphasis on changes in both form and substance.

HST 3306 The Renaissance (Group 1)

Discusses European political and cultural life from the thirteenth to the seventeenth centuries, with attention to humanism and to the rebirth of classicism in literature and the arts.

HST 3308 Topics in Early Modern Europe (Group 1)

Examines recent interpretations of and approaches to such topics as the Renaissance and Reformation; the

"crisis" in Europe, 1540-1660; gender roles; the French Revolution; and popular culture. Emphasizes recent monographs and journal literature. Requires student to make oral presentations and write short critical essays.

HST 3322 Socialism and Revolution (Group 1)

Studies the history of socialism and revolution from the early nineteenth-century utopias to the New Left of the 1960s.

HST 3339 The Modernization of Ireland (Group 1)

Analyzes themes in the growth and development of modern Ireland. Examines migration and its effects on a traditional society, the role of religion in the assertion of national independence, and modernization within the British nexus.

HST 3345 Hitler's Germany (Group 1)

Studies the history of the Third Reich, including an in-depth analysis of the process by which the political motives and methods of the Nazis ultimately won the support of the German people.

HST 3380 Seminar in the Renaissance (Group 1)

Offers research and writing concerning the Renaissance.

HST 3381 Seminar in the Reformation (Group 1)

Offers research and writing concerning the Reformation.

HST 3384 Seminar in Twentieth-Century Europe (Group 1)

Studies a selected controversy in contemporary European history.

HST 3385 Seminar in European Social History (Group 1)

Focuses on Britain, France, and Germany in the nineteenth and early twentieth centuries and looks at history "from below." Examines comparative issues in European social history. Includes the nature of social protest, the rise of organized labor, and the impact of war and revolution on the lives of ordinary people.

HST 3389 Seminar in the Modern France (Group 1)

Includes research, writing, and collective analysis of several themes in modern French social history since 1789, including the role of social class in revolutionary protest, industrialization, technology and modernization, the rise of the working class and the development of organized labor, the French peasantry in an industrial society, and the nature of the family and women's roles.

HST 3397 Seminar in Comparative Labor History (Group 1)

Analyzes issues in the history of the European labor movement, focusing on nineteenth- and twentieth-century Britain, France, and Germany. Includes the meaning of the concept of class in labor history; labor movements and politics (working-class conservatism and working-class radicalism); the place of women in the working class and in the labor movement; and worker responses to mechanization, automation, and scientific management in the twentieth century.

HST 3399 Seminar in Approaches to Women's History (Groups 1, 2, or 3)

Focuses on current issues in women's history and the methods historians use to study women's historical roles in the market place, work force, political arena, and domestic scene in Europe, Asia, the United States, and Latin America. Emphasizes the importance of comparative and interdisciplinary approaches to the history of women. Includes lectures and discussions with specialists using various approaches, assigned reading, and an independent project.

HST 3405 Colonial America: The Eighteenth Century (Group 2)

Covers the expansion of the English colonies in the New World, the development of political and social institutions, and the sources of friction with England to 1763.

HST 3410 Topics in American Reform (Group 2)

Studies movements to change aspects of American society.

HST 3413 Topics in the Civil War and Reconstruction (Group 2)

Analyzes key issues surrounding the events leading up to the Civil War, the war itself, and the Reconstruction period.

HST 3421 Political Change in Twentieth-Century America (Group 2)

Analyzes the growth of governmental function and structure, emphasizing the evolution and administration of leading policy concerns of the current century, changes in federalism and intergovernmental relations, and patterns of popular political participation and thinking.

HST 3423 The Age of Roosevelt (Group 2)

Analyzes the foreign and domestic policies and programs of the four Roosevelt administrations, set within the context of the worldwide depression and global war. Emphasizes the range of recent interpretations and analytic methods used in evaluating the place of Roosevelt in American history.

HST 3431 History of American Religion (Group 2)

Provides an overview of American religious culture, focusing on topics that illustrate its diversity and its impact on members and on society at large.

HST 3434 United States Social History in the Twentieth Century (Group 2)

Examines the recent literature on such topics as family, gender, class, migration, ethnicity, race, work, leisure, fertility, health, mortality, deviance, and social policy.

HST 3440 African-American History 1 (Group 2)

Covers the history of African-Americans to 1900, with emphasis on the role of black people in slavery and freedom.

HST 3441 African-American History 2 (Group 2)

Considers African-American history since 1900.

HST 3450 Boston as a City (Group 2)

Examines historic Boston from 1822 to the present. Emphasizes Boston's early growth as a city, the Hub as a center of pre-Civil War reform, the coming of the Irish, Boston as America's Athens, the revolutionary shift from Yankee to Irish political domination, the flamboyant era of James Michael Curley, and the development of the "New Boston."

HST 3480 Seminar in American History (Group 2)

Offers research and writing on selected aspects of American history.

HST 3481 Seminar in Colonial and Revolutionary America (Group 2)

Offers research and writing on selected topics in American history prior to 1789.

HST 3482 Seminar in American Governmental History (Group 2)

Concentrates attention on a particular problem or theme in American governmental history, emphasizing individual student research and writing.

HST 3485 Seminar in African-American History (Group 2)

Offers research and writing on an aspect of African-American history.

HST 3486 Seminar in Recent American History (Group 2)

Studies special topics from the period 1896 to the present in detail. Requires presenting a research paper on a major person, action, or movement.

HST 3501 History of Exploration (Group 3)

Surveys comprehensively exploration from ancient times to the present with emphasis on the motives for exploration and their impact on the regions discovered and on those doing the discovering.

HST 3508 Modern Africa (Group 3)

Offers a topical approach to the history of Africa since 1850.

HST 3509 Pan-Africanism (Group 3)

Explores black political thought in Africa and the Americas during the nineteenth and twentieth centuries in the context of modern nationalism and capitalism.

HST 3510 History of the Islamic Peoples (Group 3)

Studies the history, culture, and religion of the followers of Muhammad from 600 to 1800.

HST 3512 Modern Middle East (Group 3)

Studies the Middle East in the twentieth century.

HST 3523 Modern Japan (Group 3)

Discusses the history of Japan since the fall of the Tokugawa, emphasizing political and economic developments, especially after World War II.

HST 3529 Communism in China (Group 3)

Studies the Chinese Communist movement from its origins in the 1920s to the present.

HST 3531 Population in History (Group 3)

Applies demographic theory to history.

HST 3540 Economic History of the Modern Western World (Group 3)

Analyzes the economic development of the modern Western world.

HST 3600 Introduction to Public History (Group 3)

Surveys career options for historians working outside the academy. Examines the educational, ethical, and legal issues involved in historic preservation, archive and museum management, public policy planning and analysis, cultural resource management, and private sector application of the historian's craft.

HST 3601 Historical Administration (Group 3)

Considers the administration of historical agencies with attention to problems of finance and personnel and to the legal-governmental environment in which agencies operate.

HST 3602 Historical Societies and Archives (Group 3)

Analyzes the varieties of historical societies (local, state, and national) and the kinds of private (business, college, and church) and public (local, state, and national) archives; their activities and procedures; and their similarities and differences.

HST 3603 Historical Exhibits and Museums (Group 3)

Studies approaches, techniques, and special problems in the presentation of history to the public through exhibits, films, and other audiovisual and written media. Presents guest lecturers from the field and gives students the opportunity to gain practical experience.

HST 3605 Historical Editing (Group 3)

Presents a laboratory for the study and practice of historical editing. Introduces the major collections of edited papers and instructs students in editing historical documents. Gives each student a historical document to prepare for publication. Also covers the editing of history books and journals.

HST 3607 Historical Consulting (Group 3)

Surveys the professional and business skills necessary to work as an independent historical consultant or to start and successfully operate a consulting firm. Topics include identifying fields and clients, marketing, service development, computer management, ethics, and confidentiality.

HST 3610 Industrial Archeology (Group 3)

Introduces the history, practice, and place of industrial archeology. Plans examination of techniques and procedures used to unearth the industrial past and field trips to local industrial sites.

HST 3611 Historic Preservation (Group 3)

Introduces historic preservation, with attention to the history, the philosophy, and the practical problems of preservation.

HST 3612 Studies in Material Culture (Group 3)

Investigates strategies for examining material culture, including architecture, historic archeological remains, and the artifacts of domestic and work lives, as sources for historical study.

HST 3620 Oral History (Group 3)

Discusses the theory and practice of creating, processing, and using primary source material obtained by taping interviews with people whose role in history would otherwise go unrecorded.

HST 3621 Genealogical Research: Methods and Uses (Group 3)

Analyzes the tools and sources available to genealogists and historians with attention to historical applications of such data. Gives students the opportunity to use various records essential to the writing of family history.

HST 3622 Local History Methodology (Group 3)

Examines the development and uses of local history with special attention to the methodological aspects of this rapidly growing field. Gives students the opportunity to survey resources for a local community, prepare a demographic essay, and examine recent scholarship in local history.

HST 3625 Media and History (Group 3)

Explores such topics as the advantages and drawbacks of specific media, the uses and abuses of media in research and teaching, and the construction of media. Requires each student to participate in a research project involving the creation and/or evaluation of historically valid films, slide tapes, and other materials.

HST 3805 Assigned Reading 1 QH

Offers assigned reading under supervision of a faculty member.

HST 3806 Assigned Reading 2 QH

Offers assigned reading under supervision of a faculty member.

HST 3807 Assigned Reading 3 QH

Offers assigned reading under supervision of a faculty member.

HST 3811 Thesis 3 QH

Offers thesis supervision by members of the department.

HST 3812 Thesis 3 QH

Offers thesis supervision by members of the department.

HST 3813 Thesis 3 QH

Offers thesis supervision by members of the department.

HST 3821 Fieldwork in History 1 4 QH

Offers students the opportunity to get practical experience in historical agencies (including historical societies, archives, museums, exhibits, restorations, preservation projects, and the like). Requires students to work in the agency eight to ten hours a week for one quarter under the direction of an agency supervisor and departmental adviser.

HST 3822 Fieldwork in History 2 4 QH

Gives students a second opportunity to acquire practical experience in an historical agency. Requires eight to ten hours a week for one quarter under the direction of an agency supervisor and a departmental adviser.

HST 3823 Fieldwork in History 3 4 QH

Gives students a third opportunity to acquire practical experience in an historical agency. Requires eight to ten hours a week for one quarter under the direction of an agency supervisor and a departmental adviser.

Journalism (School of)

All courses carry four quarter-hours of credit unless otherwise specified.

JRN 3201 Reporting

Offers extensive practice in researching and writing news and feature stories. Analyzes methods of gathering information from government documents and court records.

JRN 3432 Local Government Reporting

Explores coverage of municipal government, with emphasis on the "beat" approach to reporting public affairs. Emphasizes practical experience in such projects as covering town meetings, board of selectmen, and other commissions and boards.

JRN 3501 History of Journalism

Examines American journalism from European and English roots. Topics include the colonial press, the great personal journalists of the nineteenth century, and the impact of major technological changes in the news media in the twentieth century.

JRN 3508 Law of the Press

Examines libel, invasion of privacy, access to government information, and other legal matters pertinent to the news media.

JRN 3512 Journalism Ethics and Issue

Discusses responsibilities of news media, ethical problems confronting decision makers in various journalis-

tic fields, and the principles found in codes of various professional societies.

JRN 3522 Magazine Writing

Covers writing and free-lancing magazine articles, analyzing magazines as markets, and selecting the best feature format—how-to-do-it, profile, personal experience, human interest, interpretive pieces, and others.

JRN 3575 News Media Management

Examines the organizational structure, production methods, and management procedures of news media companies. Explores interaction among various departments of the company and the company's interaction with the market served.

JRN 3617 The Constitution and Mass Communications

Explores freedom of the press through the study and discussion of the First Amendment and other relevant constitutional provisions. Analyzes the impact on the news media of evolving Supreme Court interpretations of the Constitution.

JRN 3677 The News Media Mix and Its Environment

Covers the media mix and issues facing the overall management of the news media, including group ownership, postal regulations, specialization of content, taxation laws, competition, audience definition, and new technologies.

JRN 3678 Applied Leadership Techniques

Focuses on establishing and maintaining internal communications, coaching, developing employees, understanding motivations, solving problems, making decisions, redesigning jobs, and analyzing leadership styles for news media application.

JRN 3679 Research Methods in Journalism

Examines the quantitative and qualitative methods of scientific inquiry as they relate to the journalist as a social scientist. Covers random sampling, content analysis, field experiments, and basic statistics.

JRN 3682 Mass Communication Theories

Examines the major theories regarding the process, nature, and influence of mass communications. Studies communications in a theoretical and research-oriented context.

JRN 3684 Literature of Journalism

Studies numerous authors and observers of the journalism profession via their works to provide a wide-ranging view of journalism, its nature and impact.

JRN 3691 Professional Paper

Analyzes a publication by the case method, using theoretical and practical perspectives. The student's

paper will analyze the publication's weaknesses and strengths and pose possible solutions.

JRN 3870 Graduate Seminar

Examines the mass media as an integral institution in society, focusing on topics of current significance. May be repeated as subject matter changes.

JRN 3890, JRN 3891 Directed Study

Offers students work on individual projects under the supervision of an instructor. May be repeated once.

JRN 3892 Topics

Requires advanced work to develop media skills not covered in other classes. May be repeated as subject matter changes.

JRN 3893, JRN 3894 Thesis

Focuses on preparing a master's thesis under supervision of a faculty committee.

JRN 3895, JRN 3896 Reporting Practicum

Focuses on preparing a series of in-depth stories on a specialized area that will be presented to appropriate media for publication. Provides instructor supervision.

Law, Policy, and Society

Core Courses

ECN 3315 Economics of Law and Public Policy 3 QH

Builds on a knowledge of intermediate microeconomic theory in evaluating the impact of laws and public policies. Relies on economic models of behavior and social welfare for economic analyses of government intervention and public policy programs. Studies unregulated market behavior, market failure and public intervention, policy and program evaluation, and the economics of contract and tort law. *Limited to Law, Policy, and Society students unless students have special permission from the instructor. Prereq. ECN 3010 or permission of instructor.*

INT 3249, INT 3250 Law, Policy, and Society Survey 2 QH

Introduces students to methodologies and perspectives used in several disciplines in studying law and society. Examines such issues as normative versus formative functions of law, social control versus individual freedom, and legal bases of conflict management in society. The course is coordinated by one instructor but lectures are given by a number of faculty members affiliated with the program to provide students with a variety of perspectives.

INT 3255 Interdisciplinary Approaches to the Study of Public Policy 2 QH

Studies different analyses of public policy, including theories of policy generation, formulation, promulgation, implementation, and evaluation.

INT 3650 Seminar in Law, Policy, and Society 1 QH

Explores how to construct and evaluate the design of research. Requires students to make two presentations in the seminar on their dissertation proposal and research design, and their state of the art paper. *Restricted to students in the Law, Policy, and Society Program who have completed all other core courses.*

LAW 2364 Legal Research and Bibliography 1 QH

Introduces students to the resources and the use of the Law Library and the basic techniques of legal research. *Open only to Law, Policy, and Society students.*

SOC 3330 Theoretical Tradition in Law, Policy, and Society 2 QH

Studies different interpretations of how the law works and what its foundations are. Examines the assumptions and the analyses of legal realism, law and economics, Marxism, critical legal studies, functionalism, conflict theory, and natural law. Examines the policy-making implication of each of these schools, each school's program for research, and the social issues each school considers worthy of attention.

Methodology Courses

SOC 3113 Introduction to Research Methods 2 QH

Introduces methods of social research including such approaches as field study and participant observation

techniques, survey techniques, interviewing and questionnaire construction, sampling procedures, experiment design, content analysis, and use of available data. *Open only to Law, Policy, and Society students.*

SOC 3114 Introduction to Quantitative Research Methods 2 QH

Introduces quantitative techniques of analysis of policy. Requires students to conduct individual projects. *Open only to Law, Policy, and Society students. Prereq. SOC 3113 or equiv.*

Directed Study and Dissertation

INT 3859 Directed Study In Law, Policy, and Society 2 QH

INT 3860 Directed Study in Law, Policy, and Society 3 QH

INT 3862 Directed Study in Law, Policy, and Society 4 QH

Involves independent reading and research with a faculty member.

INT 3861 Dissertation 0 QH

INT 3799 Dissertation Continuation 0 QH

Mathematics

MTH 3010 Basics of Analysis 4 QH

Explores differential calculus: topology of \mathbb{R}^n , compact and connected sets, continuous maps, uniform convergence, differentiable maps, the inverse and implicit function theorems, Riemann integrations, and change of variables. *Prereq. MTH 1311 or equiv.*

MTH 3101 Analysis 1: Real Analysis 4 QH

Studies real analysis: integration, differentiation, and measure theory. *Prereq. MTH 3020 or equiv.*

MTH 3102 Algebra 1: Linear Algebra 4 QH

Considers vector spaces, linear maps, dimensions, inverse matrices, eigenvalues, eigenvectors, determinants, symmetric, Hermitian and Unitary matrices, Jordan canonical form, and multilinear algebra. Introduces group theory: definition, subgroup, and the symmetric group.

MTH 3103 Analysis 2: Complex Analysis 4 QH

Examines complex function theory: holomorphic and meromorphic functions, calculus of residues, conformal mappings. *Prereq. MTH 3020 or equiv.*

MTH 3104 Algebra 2: Groups, Rings, and Modules 4 QH

Focuses on groups: subgroups, quotient groups, homomorphisms, and examples and classification of groups of small order. Studies rings: homomorphisms, ideals, quotient rings, integral domain, extension of rings, Unique factorization domain, Chinese remainder theorem, and Gauss' lemma. Explores modules: homomorphisms, submodules, quotient modules, exact sequence, structure of matrices and finitely generated modules over a PID, and structure theory of infinitely generated abelian groups.

MTH 3105 Topology 1 4 QH

Explores elements of point set topology, including general topological spaces, compactness and connect-

edness, products, and quotients. Also considers elements of algebraic topology, including homotopy, fundamental group, and covering spaces. Provides applications to simplicial complexes.

MTH 3106 Analysis 3: Functional Analysis 4 QH

Analyzes topological linear spaces, normed and Banach spaces, linear functionals, weak topology, linear operators, and Hilbert spaces. *Prereq. MTH 3101.*

MTH 3107 Topology 2: Homology Theory 4 QH

Explores singular homology groups, induced homomorphisms, exact homology sequence of a pair, excision, Mayer-Vietoris sequence, homology of CW complexes, and applications.

MTH 3222 Applied Statistics 4 QH

Considers level to measurement, central tendency, dispersion, relatedness and significance to differences, analysis of data through correlation, regression, F-test, Chi square tests, T-test, analysis of variance and analysis of covariance. Uses computer-based statistical subroutine packages. *Not for math graduate credit.*

MTH 3224 Biostatistics

Introduces the use of statistical techniques as applied to problems in the life sciences. Includes measures of central tendency and deviation, probability distributions, estimation and hypothesis testing, correlation and regression analysis, and analysis of variance. Uses a computer statistical package such as Minitab. *Not for math graduate credit.*

MTH 3230 Introduction to Computer Programming and Applications 2 QH

Introduces graduate students in sciences, social sciences, and humanities to computer programming and to the role of the computer in solving problems in their areas of study. Teaches students to write and run programs in the language BASIC and to use the computer for software packages related to various fields of endeavor. *Not for math graduate credit.*

MTH 3231 Introduction to Computer Programming and Applications 4 QH

Aims at graduate students in sciences, social sciences, and humanities who need to understand how computers can help solve problems in their fields of study. After instruction in the basics of computer programming and algorithm development, introduces students to examples of the computers used in different areas of human endeavor. Requires students to write programs in BASIC programming language and run them on a computer. *Not for math graduate credit.*

MTH 3302 Constructive Algebra 4 QH

Explores constructive development of some of the old familiar areas of algebra: principal ideal domains, Dedekind domains, factorial domains, and Noetherian rings.

MTH 3303 Set Theory 4 QH

Includes informal study of sets, including detailed discussion of the axiom of choice, well ordered sets, and transfinite arithmetic. Also considers versions of axiomatic set theory. Presents the consistency of the

continuum hypothesis and the axiom of choice, the independence of the continuum hypothesis, and the axiom of choice.

MTH 3307, MTH 3308, MTH 3309 Constructive Mathematics 1, 2, 3 4 QH each

On the constructive conception of mathematics, all the statements of mathematics are interpreted as being about computation and computational schemes. In this sequence of courses, the constructivist interpretation is exposed in detail, and significant portions of mathematics from areas of analysis, algebra, and geometry are developed in accord with it.

MTH 3311 Mathematical Logic 4 QH

Includes propositional calculus and quantificational logic; first order theories and their models; formal arithmetic; and Godel's First and Second Incompleteness Theorems.

MTH 3321 Algebra 3: Galois Theory 4 QH

Studies finite extensions of fields, automorphisms, structure of finite fields, normal and separable extensions, Galois group, Fundamental Theorem of Galois Theory, cyclotomic fields, solvability of equations by radicals, and applications (for example, coding theory).

MTH 3332 Commutative Algebra 4 QH

Covers prime ideals, localization, integral extensions; primary decomposition; Krull dimension; chain conditions, Noetherian and Artinian modules: and additional topics from ring and module theory as time permits.

MTH 3341 Ordinary Differential Equations and Applications 1: Perturbation 4 QH

Explores deterministic models in physical and life sciences. Considers regular and singular perturbation: dimensional analysis, linear and non-linear boundary layer problems, WKB theory, multiple scale analysis, qualitative analysis, and asymptotic analysis.

MTH 3342 Ordinary Differential Equations and Applications 2: Dynamical Systems 4 QH

Studies linear systems and the existence and uniqueness of solutions. Introduces dynamical systems: flows, stability, electric circuits, Poincare-Bendixson theorem, and closed orbits.

MTH 3343 Ordinary Differential Equations and Applications 3: Topics 4 QH

Deals with advanced topics in dynamical systems, such as Chaos or Hamiltonian systems, as determined by instructor.

MTH 3353 Partial Differential Equations and Applications 1 4 QH

Investigates first-order quasilinear and general nonlinear equations: method of characteristics; second-order hyperbolic, elliptic, and parabolic equations: separation of variables, potential theory, and Fourier transform. Applications include geometric optics; light, sound, and water waves; electric field theory; and heat diffusion. *Prereq.* Undergraduate differential equations.

MTH 3355 Partial Differential Equations and Applications 2 4 QH

Studies nonlinear second-order partial differential equations, method of successive approximations, and hyperbolic systems. Explores local and global existence for nonlinear diffusion equations, and variational and fixed-point methods for nonlinear elliptic equations. Applications may include gas dynamics, simple models of turbulence, and differential geometry. *Prereq.* MTH 3353.

MTH 3361 Numerical Analysis 1 4 QH

Surveys the problems, issues, and techniques of numerical analysis. Includes root finding, curve fitting, numerical integration, large linear systems of equations, and ordinary differential equations. Considers trade-offs, such as cost versus precision and speed versus space. Includes some programming. *Prereq.* FORTRAN or Pascal. Same as COM 3761.

MTH 3362 Numerical Analysis 2 4 QH

Studies the numerical solution of partial differential equations, with emphasis on elliptic equations and the finite element method. *Prereq.* MTH 3361 or equiv. Same as COM 3762.

MTH 3371 Optimal Control Theory 1

Considers linear and nonlinear control problems defined by ordinary differential equations, relaxed controls, existence theorems, and Pontryagin's maximum principle.

MTH 3373 Optimization 4 QH

Analyzes convex sets, linear and nonlinear programming, zero-sum games, dynamic programming, and iterated methods.

MTH 3386 Lie Theory 4 QH

Examines Lie groups and Lie algebras, the exponential map, examples, basic structure theorems, representation theory, and applications. Additional topics vary with the instructor and may include infinite-dimensional Lie algebras, algebraic groups, finite groups of Lie type, geometry, and analysis of homogeneous spaces.

MTH 3400 Geometry 1 4 QH

Discusses manifolds, differentiable structures, tangent bundles, tensors, vector fields and differential equations, Frobenius integrability theorem, and differential forms.

MTH 3402 Algebraic Geometry 1 4 QH

Concentrates on the techniques of algebraic geometry arising from commutative and homological algebra, beginning with a discussion of the basic results for general algebraic varieties, and developing the necessary commutative algebra as needed. Considers affine and projective varieties, morphisms of algebraic varieties, regular and singular points, and normality. Discusses algebraic curves, with a closer look at the relations between the geometry, algebra, and function theories. Examines the Riemann-Roch theorem, together with its many applications to the study of the geometry of curves. Studies the singularities of curves. *Prereq.* MTH 3102 and MTH 3104.

MTH 3407 Geometry 2**4 QH**

Examines integration on manifolds, Stokes' theorem, de Rham cohomology, and Riemannian metrics: first variation formula for arc length, geodesics, exponential maps, and geodesic completeness. Introduces Lie groups: left invariant vector fields, Lie algebras, subgroups and subalgebras, homomorphisms, one-parameter subgroups, exponential maps, bi-invariant metrics, and structure equations.

MTH 3411 Differential Geometry**4 QH**

Analyzes geometry of surfaces in the Euclidean space, with emphasis on the global aspects, using the technique of tensor calculus. Explores elements of Riemannian geometry, connections, and holonomy.

MTH 3431 Probability 1**4 QH**

Introduces probability; independent random variables; types of convergence; laws of large numbers; characteristic functions; and central limit theorem.

MTH 3432 Probability 2**4 QH**

Introduces stochastic processes; random walk; conditional expectations; Markov processes; multivariate normal distribution; and Brownian motion.

MTH 3441 Statistics 1**4 QH**

Explores parametric families of distributions; estimation and maximum likelihood; confidence intervals; testing hypotheses; and likelihood ratio. *Measure theory is not a prerequisite.*

MTH 3443 Statistical Decision Theory**4 QH**

Presents subjective probability and utility. Studies Bayesian approach to decision problems, including estimation, testing hypotheses, and linear statistical models. Considers sequential decisions, and admissibility.

MTH 3444 Analysis of Variance**4 QH**

Discusses one-sample and two-sample tests; one-way ANOVA; factorial and nested designs; Cochran's theorem; regression; analysis of covariance; and simultaneous confidence intervals.

MTH 3445 Topics in Statistics**4 QH**

Includes multivariate statistics and clustering; biostatistics; Stein's paradox and admissibility, foundations; and probabilistic and inferential aspects of reliability theory.

MTH 3448 Nonparametric Methods in Statistics**4 QH**

Presents methods for analyzing the data that is not necessarily normal. Emphasizes comparing two treatments (the Wilcoxon test, Kolmogorov-Smirnov test), comparison of several treatments (the Kruskal-Wallis test), randomized complete blocks, tests of randomness and independence, and asymptotic methods (the 8 method, Pitman efficiency).

MTH 3450 Categorical Data Analysis**4 QH**

Focuses on the analysis of data in tables, that is, with cross-classified data. Includes loglinear models (a generalization of analysis of variance methods) and logistic regression. Includes homework problems involving real data and sometimes focusing on theoretical issues.

MTH 3452 Time Series**4 QH**

Includes analysis of time series in the time domain, the frequency domain, and ARMA models.

MTH 3460 Pattern Recognition**4 QH**

Introduces the methods of pattern recognition: multivariate normal distribution, linear discriminant analysis, logistic regression, tree structured classification, cluster analysis, jackknifing and bootstrapping, and cross-validation. *This course is intended for students interested in computer science or applied statistics.*

MTH 3481 Topology 3: Cohomology Theory**4 QH**

Studies homology with coefficients, cohomology groups, cup and cap products, the cohomology ring, Künneth theorem, spectral sequence of a fibration, duality in manifolds, and applications.

MTH 3501 Data Structures**4 QH**

Considers basic structure for representing and manipulating data in computer programming: arrays, lists, stacks, queues, deques, trees, and binary trees. Studies applications to nonnumeric computations and searching and sorting. Requires students to write programs to implement these structures on a computer.

MTH 3502 Computer Organization and Assembly**4 QH****Programming**

Analyzes computer organization, hardware and software components, memory organization and addressing, machine representation of data, machine language and assembly programming, and subroutines and macros. Requires students to program several short exercises in assembly language and to undertake a term project at the end of the course.

MTH 3503 Compilers**4 QH**

Studies compilers; finite automata and lexical analysis; syntax specification; parsing; syntax-directed translations, symbol tables; run-time storage administration; error detection and recovery; code optimization; and code generation. Provides for students to work as a team on a large programming project. *Prereq. Knowledge of assembly language programming and some knowledge of data structures.*

MTH 3514 Algebraic Algorithms**4 QH**

Offers topics in algebraic algorithms in a different subspecialty each time. Topics will be chosen from: computational group theory, computational number theory, algorithms for computing with finite fields, the discrete Fourier Transform and its applications, the Knuth-Bendix algorithm for finitely presented algebras, polynomial factorization, and related topics in computer algebra. *Same as COM 3741.*

MTH 3515 Parallel Computation**4 QH**

Considers algorithms and theories for parallel computation on fixed-connection networks and on concurrent systems having a fixed number of processors. Includes algorithms for sorting, priority queues, graph algorithms, matrix multiplication, and FFT. Allows students use of a network of micros to implement some of these algorithms. May include applications to VLSI design. *Same as COM 3640.*

MTH 3521 Automata and Formal Languages 4 QH
Explores formal models of computation and regular expressions; properties of regular sets; context-free languages and pushdown automata; Chomsky hierarchy; and computability and undecidability. *Same as COM 3710.*

MTH 3522 Foundations of Artificial Intelligence 4 QH
Examines searching, goals, plans, heuristics, and representation of knowledge: nets, frames, and inheritance. Covers logic and its role in artificial intelligence, and selected applications of these ideas in other areas of artificial intelligence. *Prereq. MTH 3501 and another computer related course. Same as COM 3410.*

MTH 3524 Discrete Mathematical Models 4 QH
Introduces the notion of mathematical model, develops mathematical models relevant to problems in psychology, sociology, environmental science, political science, and other topics. Emphasizes the use of discrete mathematical tools such as graph theory, Markov chains, and game theory.

MTH 3527 Combinatorics 1: Enumeration
Examines various techniques of enumerative combinatorics, including binomial and multinomial theorems, principle of inclusion-exclusion, recurrence relation, and generating functions. Considers Stirling numbers. Covers special topics such as distributions, partitions, and polycounting theory. Discusses topics in Matching Theory, including Hall's theorem, and Marriage Problem and Rado's Selection Principle.

MTH 3528 Combinatorics 2: Coding Theory and Block Designs 4 QH
Explores block designs, including *t*-designs, orthogonal Latin Squares, difference sets and finite geometries. Includes algebraic coding, including cyclic codes, Reed-Solomon codes, BCH codes, and Reed-Muller codes. *Prereq. MTH 3102.*

MTH 3529 Graph Theory 4 QH
Examines graphs and subgraphs; trees; connectivity; Euler tours and Hamilton cycles; matchings, edge colorings; independent sets and cliques; vertex colorings; planar graphs; directed graphs; networks, the cycle space; and bond space.

MTH 3530 Topics in Combinatorics 4 QH
Focuses on topics in combinatorics in a different sub-specialty each time. Includes topics such as game theory, combinatorial geometry, measurement, and algebraic combinatorics.

MTH 3534 Analysis of Algorithms 4 QH
Discusses design and analysis of fast algorithms. Topics include advanced data structures: representing partitions, union-find algorithms, and priority queues; graph algorithms: bioconnectivity, maximum flow, shortest path, and matching minimum spanning tree; algebraic problems: matrix multiplication, polynomial multiplication, string matching, and linear programming; and probabilistic algorithms: tests for primality, and factoring polynomials and integers. *Same as COM 3390.*

MTH 3535 Complexity Theory 4 QH
Analyzes theory of relationships among complexity classes of algorithms. Covers sequential, deterministic, parallel, non-deterministic, and probabilistic models of computation, and Turing and decision tree models. Considers the class NP, and questions of completeness, especially NP-completeness, reducibility, and hierarchy of complexity classes. *Same as COM 3730.*

MTH 3804 Readings in Combinatorics 4 QH

MTH 3806 Readings in Algebra 4 QH

MTH 3807 Seminar in Algebra 4 QH

MTH 3811 Readings in Analysis 4 QH

MTH 3812 Seminar in Analysis 4 QH

MTH 3818 Seminar: Dynamical Systems 4 QH

MTH 3821 Readings in Topology 4 QH

MTH 3822 Seminar in Topology 4 QH

MTH 3824 Readings in Geometry 4 QH

MTH 3826 Readings in Statistics and Probability 4 QH

MTH 3827 Seminar in Statistics 4 QH

MTH 3836 Seminar in Combinatorics 4 QH
The department offers an assortment of courses under the general heading "seminar"—MTH 3812 through MTH 3819. At the outset of each quarter, times for organizational meetings will be posted. Schedule and content are negotiated at these meetings. Students and faculty with interest in the specialty of the seminar are encouraged to attend the organizational meeting.

MTH 3841 Readings in Philosophy of Science and Mathematics 4 QH

MTH 3850 Doctoral Dissertation 0 QH
Students may take graduate courses in the College of Computer Science as required electives with permission of the student's adviser.

Physics

I. Introductory Courses

PHY 1432 Thermodynamics and Kinetic Theory 3 QH
Includes first and second laws of thermodynamics; entropy and equilibrium; thermodynamic potentials; elementary kinetic theory; statistical mechanics; and the statistical interpretation of entropy.

PHY 1433 Introduction to Nuclear Physics 3 QH
Includes nuclear structure; nuclear masses; radioactivity-nuclear radiation; radiation and matter; detectors; fission, nuclear forces; and elementary particles. *Prereq. PHY 1303 or equiv.*

PHY 1434 Introduction to Solid State Physics 3 QH
Offers a semiclassical treatment of the thermal, magnetic, and electrical properties of crystalline solids. Includes X-ray diffraction and the reciprocal lattice; elasticity and lattice vibrations; specific heat; properties of insulators; magnetism in insulators and metals; and introduction to the band theory of metals. *Prereq. PHY 1303 and PHY 1432 or equiv.*

PHY 1435 Quantum Mechanics 1 3 QH
The first of a two-quarter sequence in quantum mechanics, focuses on observations of macroscopic and microscopic bodies, and the uncertainty principle—wave-particle duality; probability amplitudes; Schrodinger wave theory; and one-dimensional problems. *Prereq. PHY 1303 or equiv.*

PHY 1436 Quantum Mechanics 2 3 QH
Continues PHY 1435. Covers discrete and continuous states; Schrodinger equation in three dimensions; angular momentum; general theory of quantum mechanics; and applications. *Prereq. PHY 1435.*

PHY 3401 Radiation Physics 2 QH
Introduces atomic and nuclear physics for graduate students in biology and pharmacy. Includes quantum mechanics and atomic structure, nuclear structure, radioactivity, properties of nuclear radiation, and detection of radiation.

PHY 3402 Radiation Biology 2 QH
Covers the effects of radiation on biological systems and the uses of radiation in medicine and biological research. Includes effects of radiation on chemical reactions; effects of radiation on cells, organs, and individuals; theories of radiation damage and repair; imaging and tracer techniques using radiopharmaceuticals; and radiation safety and standards. *Prereq. PHY 3401 or equiv.*

PHY 3551, PHY 3552 Electronics for Scientists 1, 2 4 QH
PHY 3551 and PHY 3552 form a two-quarter sequence covering electronic techniques for experimental research in many different fields of science. Topics include principles of semiconductor devices; analog techniques (amplification, feedback, integration), and digital techniques (counting, multiplexing, logic); design of electronic subsystems (analog-to-digital converters, phase-sensitive detectors, and data-logging

systems); and understanding specifications of commercial electronic equipment. Lab examples make use of up-to-date integrated and discrete devices, such as are currently used in the electronic industry.

II. Elective Courses (Offered Every Year)

PHY 3557 Graduate Advanced Laboratory 4 QH
Presents special projects in modern experimental physics, including electronic instrumentation used in measuring physical quantities and use of microprocessors. *Prereq. PHY 3551 and PHY 3552 or permission of instructor.*

PHY 3561 Graduate Project Laboratory 4 QH
Allows students to select and carry out individual projects involving instrumentation and computation. Involves the development of some aspect of instrumentation and/or computation in an ongoing research project, and the preparation of a final report. The student will be supervised by the project leader and the course instructor. Although the course carries 4 QH, it is taken in successive winter and spring quarters. *Prereq. Permission of instructor.*

III. Required Regular Courses (Offered Every Year)

PHY 3606 Computational Physics 3 QH
Studies FORTRAN, numerical analysis, and Monte Carlo methods. Topics include algebraic manipulation, minimization and maximization of functions, eigensystems, and types and uses of graphic displays in physics.

PHY 3607, PHY 3608, PHY 3609 Mathematical Methods and Classical Mechanics A, B, C 3 QH
A three-quarter sequence dealing with mathematical methods of physics and classical mechanics. The two areas are intertwined with topics selected from the following areas. Mathematical methods covers differential equations, functions of a complex variable, linear vector spaces, Green's functions, calculus of variations, partial differential equations, integral equations, and introduction to group theory. Classical mechanics covers generalized coordinates, variational principles in classical mechanics, Lagrange's equations, Hamilton's equations, symmetry and conservation laws, central forces, classical scattering theory, small oscillations, continuous systems and classical fields, and theory of special relativity.

PHY 3611, PHY 3612, PHY 3613 Electromagnetic Theory A, B, C 3 QH
Analyzes Maxwell's equations in the vacuum and special relativity. Discusses the energy-momentum

tensor in the context of radiation problems, including bremsstrahlung and synchrotron radiation. Covers cavity radiation problems (such as microwave). Treats electromagnetic properties of matter for a variety of situations: conductors, dielectrics, ferromagnets, and superconductors. Studies electrostatic and magnetostatic boundary value problems. May cover other applications, such as stopping power of matter for relativistic particles, plasma physics, and the interaction of electromagnetic radiation with gravity. *Prereq.* PHY 1403, PHY 3601 (concurrently).

PHY 3621, PHY 3622, PHY 3623 **4 QH**
Quantum Theory A, B, C

Explores experimental basis of quantum theory, Schrodinger equation and probability interpretation of wave mechanics, uncertainty principle, application to one-dimensional problems, the harmonic oscillator, orbital angular momentum, and the central force problem. Studies quantum theory of scattering, Born approximation, phase-shift analysis, introduction to S-matrix theory, general formulation of quantum mechanics in Hilbert space, spin, identical particles and symmetrization principle, time-independent and time-dependent perturbation theory, semiclassical theory of radiation and atomic spectra, addition of angular momentum, Wigner-Eckart theorem, quantum theory of radiation, and absorption, emission, and scattering of photons. *Prereq.* PHY 1435 or equiv.

PHY 3624 Advanced Quantum Theory **4 QH**

Introduces the formulation of a relativistic quantum theory, study of the Dirac equation and its Lorentz covariance, plane-wave solution of the Dirac equation, and projection operators. Covers bound-state solutions of the Dirac equation in a Coulomb field and the hydrogen atom. Considers parity, charge conjugation, time-reversal symmetries, and propagator theory. *Prereq.* PHY 3623.

PHY 3631 Statistical Physics A **3 QH**

Studies the phenomenological theory of thermodynamics, fundamental relations and thermodynamic potentials, extremal principles of thermodynamics, applications to simple systems, stability conditions, phase transitions, thermodynamics of electric and magnetic systems, and principles of irreversible thermodynamics. *Prereq.* PHY 3603 and PHY 3621 concurrently.

PHY 3632, PHY 3633 Statistical Physics B, C **3 QH**

Explores the principles of statistical mechanics and statistical thermodynamics; density matrix; theory of ensembles; derivation of the laws of thermodynamics; Fermi-Dirac and Bose-Einstein statistics, application to gases, liquids, and solids; theory of phase transitions; second-quantization formalism for interacting systems; and cooperative phenomena. *Prereq.* PHY 3621 and PHY 3631.

PHY 3641, PHY 3642 Solid State Physics **4 QH**

Covers topics from Drude and Sommerfeld (or free electron) models of electrons in metals, crystal structure, one-electron states in crystal lattices, Bloch's Theorem, semiconductors and semi-conducting devices, effects of electron-electron interactions, lattice

vibrations and the classical and quantum theories of specific heat, optical properties of solids, investigation of crystal structure and excited states of crystals by X-ray and neutron scattering, simple transport theory based on the Boltzmann equation, and magnetic properties of solids.

PHY 3651, PHY 3652 Particle and Nuclear Physics A, B **4 QH**

Includes nuclear models, nuclear scattering and reactions, classification of particle interactions, internal symmetries, field theory, unification of weak and electromagnetic interactions, and gauge theories. *Prereq.* PHY 3624.

IV. Advanced Elective Courses

PHY 3643, PHY 3644, PHY 3645 Advanced Solid State Physics A, B, C **4 QH**

Includes selected advanced topics in the theory of solids to be chosen each time by the interested students and instructor. Covers, for example, theory of normal metals, Hartree-Fock and Random phase approximations, optical and transport properties, solid state plasmas, Raman spectroscopy, quasiparticles and collective excitations, quantum solids, and amorphous solids. *Prereq.* PHY 3633, PHY 3623, and PHY 3642.

PHY 3653, PHY 3654, PHY 3655 Fields, Particles, and Strings A, B, C **4 QH**

Introduces a local field theory. Considers symmetries of the Lagrangian and conservation laws; S-matrix and LSZ reduction formulae; perturbation theory; Feynman diagrams; spontaneous breaking and Higgs phenomenon; Glashow-Salam-Weinberg unified theory of electro-weak interactions. Briefly introduces Einstein theory of general relativity. Discusses developments leading to string theory: normal mode expansion; open and closed strings; deduction of D-10 for bosonic and D-10 for superstrings; scattering amplitudes in strings; Heterotic String; compactifications on the torus, orbifolds and Calabi-Yau manifolds; 4-D strings; and superstring phenomenology.

PHY 3661, PHY 3662, PHY 3663 Many-Body Theory A, B, C **4 QH**

Introduces some many-body problems and the required mathematical techniques. Explores theory of linear response and correlation functions; Landau's theory of Fermi liquids and applications to solids; theory of superconductivity and superfluidity; and general theory of Green's functions and diagrammatic techniques. *Prereq.* PHY 3623, PHY 3633, and PHY 3642.

PHY 3671 Foundation of General Relativity **4 QH**

Discusses the physical basis underlying relativity (the weak and strong principle of equivalence), the role of the metric tensor as a carrier of gravitational information, and the modification of the Lorentz covariant field equations in the presence of gravitation. Introduces Riemannian geometry and discusses the Einstein field equations and tests of Einstein's theory. *Prereq.* PHY 3603, PHY 3613, PHY 3623, and PHY 3672.

PHY 3672 Relativistic Astrophysics and Cosmology 4 QH
Deals with the equations for the relativistic stellar system; white dwarfs, neutron stars, and properties of pulsars; gravitational collapse and black holes; quantum radiation from black holes; super heavy stars as possible quasar energy sources; quantum effect in gravitational collapse; the metric for cosmological systems; and the big bang theory. *Prereq.* PHY 3624 and PHY 3671.

PHY 3673 Quantum Gravity 4 QH
Deals with gravitation as a quantum field, threshold properties of gravitational quantum S-matrix, quantization leading to a set of Feynman rules, calculations of simple tree diagrams, closed loop infinities, and the problem of renormalizability of quantum gravity. *Prereq.* PHY 3672.

PHY 3798 Master's Thesis Continuation 0 QH

PHY 3799 Doctoral Dissertation Continuation 0 QH

PHY 3811, PHY 3812, PHY 3813 Reading Course 1 QH

PHY 3821, PHY 3822, PHY 3823 Reading Course 2 QH

PHY 3831, PHY 3832, PHY 3833 Reading Course 3 QH

PHY 3841, PHY 3842, PHY 3843 Reading Course 4 QH
Offers reading course, or theoretical or experimental work under individual faculty supervision. *Prereq.* Permission of faculty member.

PHY 3890 Master's Thesis 1 4 QH
Student will start a master's thesis in a selected topic in experimental or theoretical physics. *Prereq.* Permission of faculty member.

PHY 3891 Master's Thesis 2 4 QH
Offers continuation and completion of master's thesis. Requires written thesis. *Prereq.* At least a B grade in PHY 3890 and permission of faculty member.

PHY 3895 Doctoral Dissertation 0 QH
Offers experimental and theoretical work for PhD candidates.

Political Science

All courses carry three quarter-hours of credit unless otherwise specified. Most courses are seminars.

POL 3500 Scope and Methods of Political Science
Examines the assumptions, principles, and so on, that underlie contemporary political science. Invites the student to consider the present practice of the discipline in the light of its history and to evaluate the discipline critically in the interest of a greater understanding of political science's nature and limits.

POL 3502 American Government and Politics
Analyzes the constitutional system and national government institutions focusing on the executive, legislative, and judicial branches. Examines political parties and pressure groups and their role in the policy process. *MPA core course.*

POL 3504 Political Psychology and Socialization
Examines theories of political psychology, opinion formation, and attitude change; political ideology; processes of individual political development and socialization; effects on mass and elite political behavior; attitudinal differences and differential socialization experiences; and individual political behavior and the political system.

POL 3506 Politics and the Mass Media
Studies the role of mass media in the formation of public opinion, with special attention given to media usage in the electoral process.

POL 3508 American Legislative Process
Studies Congress and the influence of the President, administrative bureaucracy, parties, interest groups, and public opinion on the development of legislative policy. *MPA elective.*

POL 3510 Theories of American Political Participation
Focuses on political behavior at both the national electorate level and at the level of legislative roll-call voting, analyzing the relative impact of demographic and attitudinal components as well as the effect of constituency and partisan identification upon legislative behavior.

POL 3512 American Constitutional Law 1
Employs excerpts of United States Supreme Court decisions and other primary legal materials to examine the constitutional rationale for judicial review; various philosophical approaches to the exercise of judicial power; and the scope of judicial authority to settle questions challenging the legitimacy of governmental actions in the American constitutional system.

POL 3514 American Constitutional Law 2
Uses excerpts of primary legal materials to build upon the judicial doctrines developed in POL 3512 and specifically examine the constitutional theories behind the growth of congressional prerogatives in economic and social affairs and expanding presidential power in internal and foreign matters. *Prereq.* POL 3512 or permission of the instructor.

POL 3516 The Presidency
Analyzes the development of constitutional and extra-constitutional presidential power, examining the role of the president in formulating and executing domestic and foreign policy.

POL 3518 American Electoral Behavior
Considers the theoretical and methodological assumptions of election studies of the American political system and reviews the substantive conclusions.

POL 3519 Campaigns and Elections

Studies campaign tactics and strategies. *Fieldwork required.*

POL 3520 The Judiciary

Analyzes the role of the judiciary in the American governmental process. Emphasizes those areas of constitutional law in which the courts' decisions have a profound impact on the basic structure of American politics (apportionment, economic regulation, and federalism).

POL 3522 Political Parties

Focuses on American political parties, including such aspects as organization, nominations and party reform, elections, voting behavior, and state and national political trends.

POL 3523 Interest Groups

Surveys the role of interest groups in American politics, with emphasis on distinctions between traditional economic interests, newer types of social forces, and public interest organizations.

POL 3524 Civil Rights

Examines the doctrine of constitutionalism, illustrated and amplified by a study of the substance and process of the Bill of Rights as developed in decisions of federal courts, and congressional enactments.

POL 3526 Procedural Due Process

Uses excerpts from United States Supreme Court decisions and other legal materials to examine such as the philosophical and constitutional relationships between the Fourth, Fifth, Sixth, Eighth amendments and the Fourteenth Amendment. Examines the substance of the right to fair trial, counsel, confrontation, protection against self-incrimination, and unreasonable searches and seizures are among the many procedural rights through the decisions of the Roosevelt, Vinson, Warren, and Burger courts.

POL 3531 Models of Political Systems

Examines the detail and critiques current models of political systems.

POL 3533 Eurocommunism

Studies the ideology and political behavior of the communist parties of Italy, France, and Spain, with emphasis on their independence of, and challenges to, the domestic and foreign policies of the Soviet Communist Party.

POL 3535 Parliamentary Democracy in Western Europe

Compares environment, vehicles of popular participation, and formal structures and reach of government in the parliamentary democracies of western Europe. Gives special attention to England, France, and Germany.

POL 3537 Comparative Communism

Analyzes environment, vehicles of popular participation, and formal structures and reach of government in the Soviet Union, the socialist countries of eastern Europe, and China.

POL 3539 European Political Parties

Examines by comparative cross-national study political organization and behavior in England, France, and Germany with emphasis on party leadership, strategy, organization, and constituency as well as socialization, recruitment, and participation of voters.

POL 3541 European Legislative Systems

Compares the legislatures in Britain, France, and Germany with emphasis on patterns of historical development, functions, internal organizations, and relations with the executive.

POL 3543 European National Executives

Examines by comparative cross-national study executive decision making in England, France, and Germany with emphasis on varying patterns of presidential and cabinet authority as well as relationships with the legislature.

POL 3545 Government and Politics of the Middle East

Examines the political and economic structures of the Arab states and Israel as well as inter-Arab politics and inter-state conflict in the area.

POL 3547 Government and Politics of North Africa and the Middle East

Compares the political systems and foreign policies of African states north of the Sahara. Stresses the relationship of this area with the Middle East.

POL 3550 Government and Politics of Great Britain and Northern Ireland

Analyzes government organization and political behavior in the United Kingdom. Pays special attention to executive-legislative relations, the political party system, and the politics of Northern Ireland.

POL 3551 Seminar in International Relations

Analyzes the major actors, their goals, and the means and strategies they utilize within the international system.

POL 3552 International Political Economy

Explores new directions in the field of international political economy. Stresses approaches to and trends within the field, such as: the intellectual and theoretical roots of international political economy; the management of collective goods; relations between advanced industrial states; relations between advanced industrial and less industrial states; and relations between nonstate and state actors.

POL 3553 Government and Politics of Germany

Studies political culture, federalism, and executive-legislative relations on the national level with a view to appraising the quality and durability of the current democratic system.

POL 3554 Government and Politics of France

Studies current governmental organization and political behavior in France. Pays special attention to the role of the presidency, executive-legislative relations, and the political party system.

POL 3555 International Organization

Focuses on issues of international political economy. Emphasizes the role of various international organizations in managing economic interdependence and the role of international administrators in the United Nations' search for a new international economic order. Discusses nongovernmental organizations, such as multinational corporations.

POL 3556 China in Revolution

Addresses the problems faced by a revolutionary China in forming new attitudes, instituting a revolutionary political culture, and reconstructing and developing a country on the basis of a revolutionary ideology. Illustrates the manner in which the party, state, military, education, health, science, and medicine have been modified since 1949 to ensure the continuation of a revolutionary policy.

POL 3557 Soviet-Chinese Relations

Presents a chronological and topical analysis of the Soviet-Chinese relationship since 1950 with special attention to the causes of rivalry and conflict in the 1960s and 1970s.

POL 3558 Asia and the Politics of Development

Relates the theoretical literature on political development to the concrete attempts to develop in Asia. Encourages each student to concentrate on one state and explore different ideas about political development as they relate to that state because of the diversity in levels and types of political development in Asian states. *MPA elective.*

POL 3559 Governments and Politics of Latin America

Investigates contemporary Latin American politics with particular emphasis on revolution, development strategies, and social change. Focuses on three representative nations such as Mexico, Chile, and Cuba.

POL 3560 Politics of the Developing Nations

Considers the process of political development in the third world, including both internal and international issues such as leadership patterns, the role of the military and political parties, and underlying economic and social factors. *MPA elective.*

POL 3561 Great Powers and the Middle East

Analyzes the changing nature of great power and multinational involvement in the Middle East.

POL 3562 United States-Soviet Relations

Covers the relations between the United States and the Soviet Union from 1917 to the present. Stresses the "nonrecognition" period, the breakdown of the World War II "Grand Alliance," and the nature of the current power conflict.

POL 3563 United States-Far Eastern Relations

Analyzes American diplomacy in the Far East, with primary concentration on relations since World War II with Japan, China, and Southeast Asia.

POL 3564 China's Foreign Policy

Studies the Chinese government's relations with the Third World socialist states and the West and its behavior in the United Nations. Analyzes changing

policies toward international law, trade, tourism, scholarly exchange, and foreign ventures in China. Focuses on policy objectives strategy, tactics, and the method of decision making in the foreign policy apparatus.

POL 3565 Soviet Relations with Eastern Europe

Analyzes Soviet policy in Eastern Europe, especially Russian efforts after World War II to develop communism and maintain a position of preeminence in this region.

POL 3566 Chinese Politics

Concentrates on the objectives of the Chinese revolution from 1911 to the present. Examines the political theory and institutions established to promote "permanent revolution" and evaluates the nationality of Chinese Communist policies in terms of Chinese goals. Concentrates on the changes made in domestic, economic, legal, and political policies since 1976.

POL 3567 Japanese Politics

Examines the unique Japanese electoral system, political processes and organizations, political culture and socialization, the role of business in politics, and Japanese foreign policy.

POL 3568 Sub-Saharan African Politics

Compares the political systems and foreign policies of selected African states south of the Sahara. Focuses on the Republic of South Africa and its policy of apartheid.

POL 3569 Decision Making In United States Foreign Policy

Comprehensively analyzes of the governmental mechanism and process for foreign policy decision making in the United States. Emphasizes case studies in decision making.

POL 3570 American Foreign Policy

Examines in depth selected issues concerning the role of the United States in world affairs since 1945.

POL 3571 Ethnic Political Violence

Analyzes ethnic political violence from an international perspective. Undertakes in-depth analysis of the Northern Ireland case, with reference to other key international examples. Focuses upon causes of ethnic political violence as well as potential remedies.

POL 3572 Problems of World Order 1

Emphasizes such topics as appraisal of diverse systems of public order, approaches of international law and international organization to the problem of world order, and the problem of world peace enforcement.

POL 3573 Problems of World Order 2

Stresses political problems of world order. Includes arms control and disarmament, the limits of economic growth, international political economy, population problems, and resource distribution.

POL 3574 American National Security Policy

Deals with United States national security policy in the post-World War II era. Focuses on the evolution of United States nuclear and conventional strategy and arms control efforts. Considers future military and arms control options.

POL 3575 Arab-Israeli Dispute

The Arab-Israeli confrontation has its own dynamics and a character that has changed through the decades. Students analyze the conflict's interaction with the internal politics of the Arab states and Israel, pan-Arab politics, and the role of the great powers in the region.

POL 3576 War in International Perspective

Analyzes the causes of war as well as policies for the prevention of war. Considers the changing technologies and strategies of war from both a historical and contemporary perspective. Considers specific past and present wars from an international perspective.

POL 3578 Soviet Foreign Policy

Studies Soviet foreign policy since 1964. Discusses détente in relations with the United States; polycentrism in East Europe; involvements and commitments in the Middle East and Africa; and the dispute with China.

POL 3580 The United Nations

Analyzes selected topics on the nonpolitical work of the United Nations: human rights; economic, social, health, and related problems; and decolonization and the trusteeship system.

POL 3581 International Peacekeeping

Investigates the origins, history, and theory of interventionary peacekeeping, with reference to the documentation of the United Nations. Explores an assessment of this method of maintaining regional stability and a projection of potential means of developing the method to broader applicability.

POL 3583 International Law

Examines selected topics in international law not covered in POL 3572 and POL 3573.

POL 3584 Regional Organizations

Studies regional organizations, such as EEC or OAU, to determine the capability of such organizations to promote economic development and political influence.

POL 3585 The Atlantic Community

Analyzes European-American diplomacy with particular stress upon security and economic matters. Considers the integration of Europe, American responses, and the results of these interactions for world political and economic stability.

POL 3586 Nationalism

Studies the evolution and role of nationalism in both theory and practice. Analyzes representative nationalistic movements and theories.

POL 3587 Politics of Revolution and Change

Analyzes the nature of political change with attention to both theory and practice. Discusses revolution, major trends in contemporary politics, and the relationship between political change and technological, scientific, or social change.

POL 3589 Terrorism, Violence, and Politics

Analyzes the theory and practice of terror, violence, coercion, force, and threats in political life.

POL 3590 Crisis Politics in Democracies and Dictatorships

Analyzes governmental response to crises and emergencies. Considers such topics as war powers, riot and rebellions, martial law, transfer of regime, succession problems, economic crises, presidential emergency powers, national security powers, executive privilege, and impeachment.

POL 3591 Totalitarianism

Analyzes totalitarianism and dictatorship, including study of historical background, fundamental characteristics; theories of origin, nature, and significance; and evaluation of techniques, ideologies, policies, and instruments of power. Emphasizes the government and politics of the Soviet Union.

POL 3593 Ancient and Medieval Political Thought

Focuses on the development of political thought from Greek antiquity to the end of the Middle Ages, utilizing both historical and analytical approaches. Considers the cultural, social, and intellectual context within which political theories develop.

POL 3594 Modern Political Thought

Examines political thought from Machiavelli to Marx.

POL 3595 Contemporary Political Theory

Explores the main currents of political thought in the latter half of the nineteenth and the twentieth centuries with special emphasis on the relations between political theory philosophy and political science.

POL 3596 Marxism

Examines the theory and practice of Marxism, including its background and origins, and its subsequent development.

POL 3597 Trends in American Political Thought

Examines intellectual concepts and movements that have informed and influenced American political life, with emphasis upon those relating to the making and execution of public policy. *MPA elective.*

POL 3600 Introduction to Public Administration

Introduces literature and the major topics in public administration with special attention given to the interrelationships of politics and administration. *MPA core course.*

POL 3601 Public Personnel Administration

Introduces students to the public personnel function from a managerial standpoint. Addresses methods of constructive leadership of government personnel, leadership that encourages a more competent, motivated, and representative, public administrative workforce. Employs case studies and films, along with assigned readings. *MPA core course.*

POL 3602 Organization Theory and Management

Examines the general principles underlying organizational structures and processes. Topics include models and ideal types, open systems theories, organizational technologies, decision making, and organizational development and change. *MPA core course.*

POL 3603 Public Budgeting and Financial Management

Emphasizes the public budgeting function in its relationship to other functions of public administration.

Approaches the subject from a management perspective, and examines conflicting legislative and executive finance and budgeting interests. Includes an illustration of the budget cycle and an examination of the mechanics of budget preparation. Considers means for improving budget decision making and administration through quantitative and other methods. *MPA core course.*

POL 3604 Techniques of Policy Analysis

Introduces the study of public policy analysis. Provides a systematic approach for understanding the origins, formulation, implementation, and impacts of government "outputs." Following a review of key analytic concepts and alternative theoretical perspectives, considers the political dimensions of public policymaking as well as the technical aspects of program design and evaluation within the general framework of the "natural history" of the policymaking process. Uses case materials drawn from a broad spectrum of contemporary substantive policy areas. *MPA core course.*

POL 3605 Quantitative Techniques 1

Considers the theory and process of analytical reasoning about policy issues using statistical methods and computers. Topics include descriptive statistics, inference, and bivariate analysis. *MPA core course.*

POL 3606 Quantitative Techniques for Public Administrators 2

Presents an intermediate course in quantitative methods with an emphasis on techniques and practical applications of value to administrators and analysts in the public sector. Includes significance testing, bivariate regression correlation, and multiple regression and multiple correlation. Teaches how to generate and interpret statistical analyses through use of the SPSS "packaged" program. *MPA core course. Prereq. POL 3605.*

POL 3610 Methods of Economic Analysis for Public Administrators

Introduces a construct of public economy as a means for focusing on contemporary economic issues facing public administrators. Serves as a prerequisite for students lacking economic course work at the baccalaureate level. *MPA core course.*

POL 3611 Intergovernmental Relations

Offers an institutional-behavioral analysis of the changing relationship among the various levels of American government—national, state, and local—relating the pattern of change to the social and economic forces that underlie it. *MPA elective.*

POL 3613 Constitutional Law in Public Administration

Introduces American constitutional law and the federal system using case materials and emphasizing principles of importance to public administrators, including such constitutional concepts as separation of powers, judicial review, dual federalism, legislative investigating power, executive impoundment, federal preemption, and the appointment and removal power. *MPA elective.*

POL 3614 Administrative Ethics in Public Management

Analyzes ethical problems in American public administration including discussion of ethical dilemmas frequently faced by public managers. *MPA elective.*

POL 3615 Development Administration

Takes a "manager's-eye view" of the formulation, implementation, evaluation and improvement of development projects in less developed countries. Includes integrated rural development, community participation, lower- and middle-level management decentralization, and management training. *MPA elective.*

POL 3616 State Government

Appraises the problems of contemporary state government in the United States. Emphasizes the state government of Massachusetts. Stresses individual research. *MPA elective.*

POL 3622 Urban Government

Explores problems in urban government such as political independence, government finance and administration, rapid growth of suburban and metropolitan areas, and decline and decay of the core city. Emphasizes the Boston metropolitan area. Stresses individual research. *MPA elective.*

POL 3623 Transportation Policy

Examines the role of politics, governmental mechanisms, and public policy in the transportation planning process. Emphasizes political interest groups and how they affect transportation policy on the federal, state, and local levels. *MPA elective.*

POL 3624 Problems of Community Development

Examines the role of government, politics, and public policy in the urban process and related problems in the United States. *MPA elective.*

POL 3625 Collective Bargaining and Labor Relations in the Public Sector

Studies labor relations in public enterprises, with special emphasis on the role of public employee unions and collective bargaining. Emphasizes labor relations in the public sector (including employee rights and legal issues) and the history, theory, techniques, and impacts of public employee unionism and collective bargaining. *MPA elective.*

POL 3626 Grantsmanship

Provides students the opportunity to increase their knowledge of the federal grant system. Emphasizes developing effective grant proposals and improving management skills. *MPA elective.*

POL 3629 Computer Applications

Provides basic knowledge of computer applications for public administrators. Develops an understanding of computer technology as a resource in government decision making and administration. Topics include management information systems, database management, spreadsheet applications, critical path methods, PERT, and word processing. *MPA core course. Covers requirement previously met by POL 3607.*

POL 3630 Health Administration

Introduces the process and purposes of management within hospitals and other health care organizations. Includes financial management, quality control, strategic planning, personnel management, marketing, and information systems. *MPA elective.*

POL 3631 Urban Development

Helps students analyze urban development issues and learn how to be effective in creating and implementing public development policy and programs. Explores subsidies and taxes, housing, commercial and industrial development, and job creation and training projects in terms of their historical, political, economic, and social dimensions. Emphasizes developing a development program through the role-playing method. *MPA elective.*

POL 3632 Public Fiscal Management

Studies the interrelationships in public administration between systems of finance and the achievement of program objectives. Stresses aspects of the budgetary process that bear on fiscal policy and appropriations. *MPA core course.*

POL 3634 Functions and Techniques of Public Management

Provides an introduction to problems in public management and techniques for dealing with them including functions of middle management, supervision, administration of staff activities (for example, planning, personnel, budget), organization and methods, public relations, managerial use of computer-based techniques, and tactics and strategies of management. *MPA elective.*

POL 3635 Environment and Energy Policy

Considers the legal, political, administrative, and intergovernmental factors involved in the formulation of public policy and the exercise of public power in regulating the use of the environment. Stresses individual research. *MPA elective.*

POL 3636 Comparative Public Policy

Offers an analysis of public policy in a comparative perspective. Focuses on a number of specific policy sectors and problems. *MPA elective.*

POL 3637 Comparative Public Administration

Compares approaches to public administration in selected democratic governments in the United States and Europe. *MPA elective.*

POL 3638 Marketing for Public Managers

Introduces present and future public managers to traditional marketing concepts and analyzes how using these concepts can create effective public programs. *MPA elective.*

POL 3639 Federal Administrative Law

Studies rule making, adjudication (formal and informal), administrative finality and judicial review, administrative procedure, scope of administrative powers, and enforcement techniques. *MPA elective.*

POL 3640 Governmental Accounting

Examines principles and procedures involved in governmental accounting. *MPA elective.*

POL 3641 Techniques of Program Evaluation

Reviews methodologies for assessing public policy outcomes with a special emphasis on health and social welfare programs. Includes experimental and quasi-experimental research designs, the value and limits of case analysis, political and organizational barriers to effectively conducting an evaluation, writing the evaluation study report, and procedures for instituting needed program change following the evaluation. *MPA elective.*

POL 3642 Management Planning and Decision Making

Reviews the growth of the planning approach to public management and its application in specific agencies. Includes organization of the management planning function, budget planning, and methods of providing planning forecasts. *MPA elective.*

POL 3643 Organizational Psychology and Behavior

Examines the literature, theories, and concepts of administrative behavior as it has evolved with emphasis on the development of self-awareness and the building of interpersonal skills. *MPA elective.*

POL 3644 Public Policy Issues in Human Services

Discusses the origins and development of the Social Security Public Assistance Income Maintenance and various health-care programs. Focuses on controversial public policy issues of retirement, survivors, disability insurance, Aid to Families with Dependent Children, Medicare, and Medicaid, with the objective of helping students to develop understanding of the push and pull of many different viewpoints involved in public policy development. *MPA elective.*

POL 3645 Program Implementation

Examines the implementation stage of the policy process, specifically the implementation of federally funded social programs by local governments. Includes intergovernmental fiscal configuration; the capacity to implement; the politics of implementation; and implementation feasibility. *MPA elective.*

POL 3646 Position Management

Examines the bases of position classification at the state, federal, and local levels. After reviewing the process of job analysis, examines several classification schemes including the new federal factor benchmark system. Includes wage and salary administration. *MPA elective.*

POL 3647 Manpower Policy and Administration

Introduces the student to human resource policy and management issues within a broader context of social policy. Includes an investigation of specific manpower programs and current issues of importance to the administrator. *MPA elective.*

POL 3648 Legal Topics for Health Administration

Provides an overview of legal issues and topics of relevance to the field of health administration, including malpractice, accreditation, and affiliations. *MPA elective.*

POL 3649 Regulatory Administration

Offers the public manager a conceptual and historical overview of the development of regulatory policy and

mechanisms, focusing on issues at the public-private interface as well as evaluating the practical implications of government intervention. Evaluates the political, economic, and administrative effects of a nonregulatory versus regulatory approach to public management. *MPA elective*

POL 3650 Group Dynamics

Focuses on the human problems public managers face in their daily work based upon an introductory understanding of organizational psychology and behavior. Using a group dynamics format, provides the opportunity to integrate the literature in organizational psychology, work issues, and personal growth concerns. *MPA elective*

POL 3651 Legal Issues in Public Finance and Budgeting

Examines the historical and contemporary legal issues that are most relevant to public finance. Includes legal issues in taxation and borrowing, budget execution and auditing, employee liability, and budget reform. *MPA elective*

POL 3652 Civil Liberties in Public Administration

Discusses First Amendment rights as they impact upon the public sector. Referring to appropriate court cases, includes employee rights and obligations with respect to freedom of speech, freedom of association, loyalty oaths, and professional certification, as well as legislative powers. *MPA elective*

POL 3653 Survey Research for Public Administration

Focuses on the entire survey research process from ample selection to data analysis. Discusses regression for time series analysis and some computer applications. *Prereq. POL 3605.*

POL 3654 Computer Software for Public Administrators

Introduces several software packages for statistics, management file construction and use, word processing, and graphics. *Prereq. POL 3605.*

POL 3655 Politics and Administration in Cities and Towns

Examines the political and administrative structures that influence the conduct of city and town governments. Emphasizes dynamic relationships between these structures and the implications for public policy-making. *MPA elective*

POL 3656 Business/Government Relations

Extensively examines the relationship between the United States government and the private economy from a historical and a contemporary perspective. Analyzes a number of public policy areas in which public and private actors interact. Examines stabilization policy, regulation, antitrust, and social welfare policy in the context of alternative interpretations of the United States political economy. *MPA elective*

POL 3657 Organizational Analysis

Studies the structure and processes of organization essential for problem solving and for effecting organizational change. Emphasizes the application of social science theory and administrative principles in administrative problem identification and problem resolution. *MPA elective*

POL 3658 State and Local Finance and Budgeting

Explores the many channels that the state budget must travel before it becomes a viable document. Explores in depth the several ways by which the budget can be affected before and after it is signed into law. *MPA elective*

POL 3659 Municipal Finance

Discusses the special problems of budgeting and finance in local governments, including budget preparation and presentation, debt management, capital financing, and local taxation policy. *MPA elective*

POL 3660 Development Planning

Focuses on the dynamics and activities of host-government, bilateral, and multilateral organizations as they analyze and tackle such problem areas as agriculture, education, health, population, and land reform in developing countries. Stresses the special role of public administration in less developed countries. *MPA elective*

POL 3661 Municipal Law

Reviews for the nonlawyer the law of municipal corporations. Includes general powers and duties, charters, ordinances, administrative rules and regulations, officers and employees, tort liability, policy powers, planning and zoning, taxation and borrowing, elections, and licenses and permits. *MPA elective*

POL 3662 Comparative Urban Government and Administration

Analyzes decision-making structures and processes in selected urban areas, including an examination of world organization trends and implications for administration and politics of cities; changing scopes, scale, participants, and organization of urban politics; and selected issues such as *urban housing finance*, leadership, planning, and goals. *MPA elective*

POL 3663 Techniques of Public Budgeting

Introduces the practical skills necessary for the formulation, evaluation, and presentation of budget data. Analyzes budgetary information (raw data) provided from computer simulations and from state and local governments and adapts it to various types of budget formats. *MPA elective*

POL 3664 Contemporary Issues in Public Finance and Budgeting

Studies public budgeting in the context of the political, financial, and economic environment of present-day government. Emphasizes contemporary issues and events which affect budgetary processes in the public sector is included. *MPA elective*

POL 3665 Women in Public Management

Analyzes the multiple roots of problems experienced by women in public management positions and solutions for alleviating such problems. Requires students to engage in experiential learning exercises in addition to academic work. *MPA elective*

POL 3666 Housing Crisis

Surveys the housing problems associated with the poor, the elderly, and middle-class citizens. Studies housing policies that have been enacted on the national

and local levels and assesses the impact of these policies. *MPA elective.*

POL 3667 Equal Opportunity in Public Administration

Examines barriers to EEO; helps students develop an awareness of issues surrounding the Affirmative Action Program and particularly some of the historical perspectives of discrimination against minorities and women; and offers instruction in techniques for developing a meaningful equal opportunity program for public organizations. *MPA elective.*

POL 3668 Legal Issues in Public Personnel Administration

Reviews and discusses fact situations and evidence that give rise to public employment litigation with emphasis on civil rights and Equal Employment Opportunities court actions. Discusses the type of evidence used in litigation and the types of defenses available to public employers. *MPA elective.*

POL 3670 Public Relations in Public Administration

Focuses on evaluating the public manager's role in the process of communication with the public. Evaluates issues of imagery and accountability as well as current topics. *MPA elective.*

POL 3671 Social Welfare Policy and Administration

Examines the historical, political, social, and economic determinants of the United States social welfare system. Analyzes current policies and programs using a dynamic systems model. Includes practical experience from all levels of government. *MPA elective.*

POL 3672 Policy Issues and Administration in Mental Health Care

Analyzes policymaking and administration within the contemporary mental health system, with a special focus on the process and impacts of deinstitutionalization. *MPA elective.*

POL 3673 Career Development

Helps students make career choices, identify their own career stages, and better understand their role as part of a work organization, with the purpose of assisting students in career planning. *MPA elective.*

POL 3674 Federal, State, and Local Financial Relations

Explores the relationships between the local and state levels of government in the assessment and collection of taxes, budgeting, debt management, and state aid. Evaluates the federal role and fiscal intergovernmental relations. *MPA elective.*

POL 3675 Health Policy and Politics

Introduces the study of modern health care policies, programs, and politics. Begins with a descriptive overview of the contemporary health system in America, followed by analysis of major issues and problems in the areas of ambulatory care, acute inpatient care, and long-term care services. Discusses the current crisis in health care costs, together with various proposed solutions such as health planning, certificate-of-need regulation, and different health insurance reimbursement mechanisms. Includes the deinstitutionalization of the mentally ill, medical ethics, and the foreign experience in health care. *MPA elective.*

POL 3676 Practices in Self-Development in Public Management

Focuses upon practical aspects of public management. Includes time management, communication (for example, memorandum and report writing), control processes, and conflict management. *MPA elective.*

POL 3677 Elder Services Policy and Administration

Investigates the historical, socio-economic, and philosophical determinants of the emerging elder services system. Studies current policies and programs using various comparisons, case studies, and dynamic models. Focuses on contemporary problems in the administration of elder care delivery systems, funding sources, and future trends. *MPA elective.*

POL 3678 Federal Bureaucracy

Examines dynamic and structural aspects of the national government, with attention to the place of the national administration in the federal system. *MPA elective.*

POL 3679 Contemporary Issues in Third World Development

Examines the major themes in development studies today. Explores approaches to development and modernization, dependency theory, food aid and production, population growth, equity and poverty, rural and urban development, health and nutrition, education, and the international context of development assistance. Students considering a development administration concentration should try to take this course as their first in the field of development. *MPA elective.*

POL 3690 Topical Seminar

Offers a special seminar dealing with current important issues relevant to public administration. *MPA elective.*

POL 3696 Politics of Finance and Budgeting

Examines the political environment of public budgeting from both historical and contemporary perspectives. Stresses the relationship between executive and legislative institutions at the federal, state, and local levels. *MPA elective.*

POL 3697 Seminar in Public Personnel Administration

Analyzes specific topics and issues in public personnel administration to present material of current interest and allowing in-depth research into specified areas where appropriate. Subject matter to be covered is described in registration materials. *MPA elective.*

POL 3698 Case Studies in Policy Analysis

Provides the opportunity for detailed analysis of key issues in public policy. Requires students to complete oral and written analyses of case studies that reflect these issues. Emphasizes developing the ability to utilize the relevant analytic techniques in resolving the problems confronting government. *MPA elective.*

POL 3699 Seminar in State and Urban Administration

Analyzes specified topics and issues in state and urban administration with the purpose of presenting material of current interest and allowing in-depth research into specified areas where appropriate. Subject matter to be covered is described in registration materials. *MPA elective.*

- POL 3798 Master's Thesis Continuation** 0 QH
- POL 3884 Assigned Reading** 1 QH
Offers assigned reading under the supervision of a faculty member.
- POL 3886 Assigned Reading**
Offers assigned reading under the supervision of a faculty member.
- POL 3890 Assigned Reading** 6 QH
Offers assigned reading under the supervision of a faculty member.

- POL 3891 Internship**
Offers study directly related to an internship assignment.
- POL 3892 Internship Readings and Analysis**
Offers study directly related to an internship assignment.
- POL 3895 Thesis** 6 QH
Offers thesis supervision by individual members of the department.
- POL 3896 Thesis** 9 QH
Offers thesis supervision by individual members of the

Psychology

All courses carry three quarter-hours of credit unless otherwise specified.

PSY 3013 Learning, PSY 3014 Neuropsychology 1, PSY 3015 Neuropsychology 2, PSY 3016 Language, PSY 3017 Cognition, PSY 3018 Perception, PSY 3019 Sensation, PSY 3020 Personality, PSY 3021 Social Psychology Proseminar

Serves as first-level graduate courses. Include faculty lectures, student presentations, and discussions of important theoretical, experimental, and methodological approaches to the understanding and explanation of behavior and the mental processes underlying behavior. Emphasizes language and cognition; learning motivation and behavior analysis; behavioral neuroscience; sensation and perception; and social/personality.

PSY 3111, PSY 3211, PSY 3311 Quantitative Methods 1, 2, 3
Surveys the quantitative methods used in experimental psychology, emphasizing applications of computer programming, theory of functions and relations, curve fitting, probability functions, set theory, and analysis of variance.

PSY 3119, PSY 3219, PSY 3319 Attention 1, 2, 3
Considers the topic of attention (selective and general, for example, arousal, and attentiveness). Discusses behavioral, cognitive, and physiological aspects.

PSY 3191 Heredity and Society
Critically examines behavior-genetic research, its social-historical setting, methods, and substantive conclusions. Begins with research on the genetics of intelligence and continues on to the genetics of psychopathology and, depending on class interest, such areas as criminality, alcoholism, and obesity.

PSY 3449 Current Issues in Experimental Psychology
Discusses current theoretical and methodological issues in selected areas of experimental psychology.

Experimental Personality and Social Psychology

PSY 3171, PSY 3271 Psychopathology 1, 2 4 QH
Considers the major forms of psychopathology, including the neuroses (obsessional states, hysteria, anxiety states, phobias), the psychoses (schizophrenia, mania,

depression, paranoia), psychosomatics, sociopathy, conduct disorders, organic disorders, and mental retardation.

PSY 3371, PSY 3372, PSY 3373 Social Psychology 1, 2, 3
Surveys theory and research in social psychology. Covers attitude and attitude change, aggression, altruism, group processes, person perception, and social cognition.

PSY 3477, PSY 3577 Personality Theory and Research 1, 2
Surveys representative theoretical formulations of the normal personality and its development, and examines experimental evidence bearing upon relevant concepts and assumptions (anxiety, repression, aggression, cognitive styles).

Language and Cognition

PSY 3126 Child Language Development
Contrasts learning theory approaches to language acquisition with psycholinguistic and neurogenic theories. Analyzes works of Skinner and Chomsky, and discusses implications for both normal and abnormal language development.

PSY 3161, PSY 3261 Cognition and Psycholinguistics 1, 2
Offers research in cognition and psycholinguistics.

PSY 3166 Psycholinguistics
Provides in-depth analysis of research methods and findings in selected problems in the psychology of language, including developmental, anthropological, and experimental psycholinguistics.

PSY 3167 Topics in Cognitive Development
Presents different theories of cognitive development. Possible issues include: the implications of stage theories; the relationship between cognitive development in a person and theory change in science; the difference between knowledge acquisition in childhood and in adulthood; the nature of the mind at birth; whether there are any alternatives to theories postulating stages or simple knowledge accumulation; and the role of constraints in development.

PSY 3169 Seminar in the Structure of American Sign Language
Introduces students to current issues in linguistic theory as well as to update them on the specific literature on ASL research. Focuses upon one particular area of linguistic theory as it relates to current ASL research; for example, phonology, morphology, syntax, semantics, or discourse.

PSY 3264 Language Acquisition

Present an overview of issues in language acquisition that will be integrated with in-depth discussions of selected topics.

PSY 3269 Linguistic Theory and ASL: Special Topics

Focuses upon a particular body of literature related to current linguistic theory and its relevance to ASL. Involves extensive reading of current articles and dissertations in linguistics in general and in ASL linguistics. Requires students to do presentations during the course of the seminar. *Prereq.* *Introduction to ASL linguistics or introduction to linguistics.*

Learning and Behavioral Analysis

PSY 3121 Experimental Design in Applied Research

Studies in detail of experimental methods, emphasizing critical analysis of published research reports and the implementation of the methods in service settings. Provides the opportunity to learn and evaluate observational measurement and data-collection techniques. Requires a feasible experimental design, with graphed actual or hypothetical data, that must be written in the form of a scientific report.

PSY 3122, PSY 3222, PSY 3322, PSY 3422, PSY 3522

Applied Programming Seminar 1, 2, 3, 4, 5

Allows students to design, test, and evaluate instructional programs for teaching specific subject matter for remedial application to behavior problems and to test instructional theory. Provides supervision through a weekly programming research and data seminar in collaboration with the student's adviser.

PSY 3123 Programmed Learning

Reviews the history and theoretical and experimental bases of programmed instruction and errorless learning. Emphasizes the detailed analysis of stimulus control—its measurement, and ways to produce it.

PSY 3129 Mental Retardation Seminar

Provides an interdisciplinary seminar taught by faculty from the several Boston-area universities associated with the University-affiliated facility. Defines the role of each discipline in the care and treatment of retarded people and coordinates with the functions of other relevant disciplines. Includes specialties of communication disorders (Emerson College), dentistry (Tufts University), medical disciplines (e.g., pediatrics, neurology, orthopedics, genetics—Massachusetts General Hospital, Harvard Medical School), nursing (Boston University), nutrition (Framingham Teacher's College), occupational therapy and physical therapy (Sargent College of Boston University), social work (Boston University and Simmons College), sociology (Brandeis University), special education (Boston Uni-

versity), and psychology (Northeastern University).

PSY 3132, PSY 3232 Behavior Intervention 1, 2

Focuses on behavioral intervention techniques. Emphasizes the functional analysis of behavior.

PSY 3133, PSY 3233, PSY 3333

Advanced Learning Seminars 1, 2, 3

Covers contemporary research in operant conditioning, with emphasis on relating the techniques of behavioral analysis to problems of reinforcement, motivation, comparative psychophysics, and physiological psychology.

PSY 3143, PSY 3243 Learning Principles and Applications 1, 2

4 QH

Analyzes principles from behavioral learning research and their application to the process of behavior change for learning, remediation, and treatment. Stresses educational settings.

PSY 3229 Administration of Mental Retardation Services

Presents comprehensive overview of general and specialized services for retarded individuals from organizational and administrative points of view. Considers issues in planning and initiating new programs, service delivery, staffing, and economics. Includes visits to varied types of facilities to focus on administrative concerns.

PSY 3321, PSY 3421 Systematic Inquiry in Applied Research 1, 2

Requires each student to collect a comprehensive bibliography on a significant topic in applied behavior research and complete a thorough review via written and oral presentations. Emphasizes the integration and analysis of experimental findings and theoretical foundations of the research area, the critical evaluation of current research, and the definition of potentially fruitful future work.

PSY 3324 Behavior Change in Institutions

Review successful projects that have been carried out to provide effective remediation and rehabilitation in institutions for the mentally retarded, the juvenile delinquent, and the developing individual (schools).

PSY 3336 Memory

Provides a seminar covering theoretical, experimental and methodological issues relevant to the study of remembering and forgetting.

PSY 3649 Community Based Treatment

Focuses on the treatment of mentally retarded individuals in a community setting.

Neuropsychology

PSY 3127, PSY 3128 Neurological and Sensory Impairments Seminars 1, 2

Analyzes etiology, assessment, and diagnosis, clinical characteristics, and education of the mentally retarded with visual, hearing, and motor deficits. In addition to discussion, provides experiences in evaluation and remedial programming, via the application of operant techniques.

PSY 3145 Human Neuropsychology 1

Addresses brain function and structure. Relates specific disorders seen in the clinical population to disfunction of the nervous system.

PSY 3151 Brain and Behavior 1

Introduces basic methods of physiological psychology, including animal surgery, electrical stimulation of the brain, electrophysiological recording, and histological techniques. Presents the opportunity to gain experience in these methods by carrying out a limited research project during the semester. Enrollment limited to ten. *Prereq.* Admission to doctoral candidacy or permission of instructor.

PSY 3155, PSY 3255 Sensory Psychophysiology 1, 2

Concentrates on the anatomy and physiology of the various sensory systems and correlation of these data with psychophysical and perceptual concepts. Includes lab work.

PSY 3158 Psychobiology of Reward Processes

Examines the brain mechanism psychobiology of reward or reinforcement processes, focusing heavily on the psychophysical method in brain stimulation reward. Studies how behavior can be used to measure refractory periods, latent potential summation, conduction velocity, and other properties of the directly excited neural tissue. Compares various reward measurement paradigms in regard to pharmacology studies and self-stimulation-associated phenomena such as priming or stimulation-induced feeding. Discusses other rewards, including stimulant drug self-administration and food reward.

PSY 3159 Neurochemistry and Behavior

Examines different experimental approaches to the problems involved in uncovering the relationships between changes in brain activity and changes in behavior produced by drugs. Discusses current theorizing on the role of early experience, environmental factors, biological rhythms, and other facets in the determination of drug-induced behavioral changes.

PSY 3225 Biological Bases of Mental Retardation

Considers the relationship between biological malfunction, of the brain in particular, and the defective learning ability and other behavioral abnormalities which constitute mental retardation. Aims toward as comprehensive a survey as time permits. Includes actual case presentations as illustrative examples.

PSY 3251 Brain and Behavior 2

Presents selected topics in the neurophysiology of perception, emotion, motivation, learning, and memory, with emphasis upon a critical evaluation of recent literature. Enrollment limited to fifteen. *Prereq.* Admission to doctoral candidacy or permission of instructor.

PSY 3265 Human Functional Neuroanatomy

Studies the neuroanatomy of the human brain through the direct inspection of human brain tissue in a laboratory style format. Considers functional considerations as a consequence of anatomical structure. Requires considerable independent study with the specimens

and text. Requires students to be responsible for memorizing anatomical details as well as understand broad principles of brain organization, development, and action. Also presents clinical manifestations of brain damage.

PSY 3295 Special Topics in Behavioral Neuroscience

In recent times considerable published work has appeared on the topic of computation in both model and real neuronal networks. The fundamental (and old) idea is to understand brain function by examining how its elements perform calculations. This seminar is intended to introduce students in the behavioral sciences to selected topics in computational neuroscience. Topics will be selected on the criteria of recent publication in an area of sustained advancement and will include computation models in vision, audition, the control of movement, and learning. To maintain the introductory spirit, the seminar will begin with a tutorial on the physiology of neurons, synaptic transmission, and computation in simple nerve nets (two and three elements).

PSY 3355, PSY 3455, PSY 3555 Physiological and Comparative Psychology 1, 2, 3

Present seminars on a shared background, key concepts, and central issues in the field of physiological and comparative psychology.

Sensation and Perception**PSY 3185 Electrophysiological Recording**

Discusses methods for recording electrophysiological activity from the human subject including electroencephalography, auditory and visual-evoked potential recording, electroretinography. Considers some of the principal findings that have been obtained with these methods and their importance for the interpretation of a variety of psychological phenomena.

PSY 3188, PSY 3288, PSY 3388 Vision 1, 2, 3

Provides seminars in classical and modern problems in vision. Presents recent journal articles as primary source materials for discussion. Considers problems of stimulus specification, retinal structure, photochemistry, and psychophysical measures of sensitivity, color vision, and electrophysiology.

PSY 3189 Psychoacoustics

Deals with the relationship between sound and auditory perception. After five tutorial sessions on the physics and laboratory generation of sound, thresholds, masking, loudness, pitch, and sound localization, requires students to lead discussions based on research papers in the psychoacoustic literature.

PSY 3289 Perception

Considers in detail research in such areas as form, space, and pattern perception, recognition, and the effects of set and motivation on perception. Considers physiological concomitants of perceptual phenomena.

PSY 3418 Modern Psychophysics

Offers a mathematical study of signal-detection theory; human and animal psychophysical methods; and theory of the ideal observer.

Special Topics

PSY 3291 Research Laboratory 1 QH
Allows students and faculty advisers to discuss lab projects, current literature, theory, and applications.

PSY 3419 Special Topics in Psychology 3 QH

PSY 3521 MABA Research 0 QH
Students enrolled in the MABA program may sign up for this course beginning in their *third* year to indicate that they are continuing their research.

PSY 3549 Practicum
Offers supervised practicum experience emphasizing the application of principles of psychology to human behavior.

PSY 3798 Master's Thesis Continuation 0 QH
Offers continuation of experimental work for the master's degree requirement.

PSY 3799 Doctoral Dissertation Continuation 0 QH
Offers continuation of experimental and theoretical work for PhD candidates.

PSY 3891 Thesis 2 QH
Offers experimental work for the master's degree requirement.

PSY 3894 Dissertation 0 QH
Offers experimental and theoretical work for PhD candidates.

Interdisciplinary Courses

INT 3225 Foundations of Neural Science
Introduces some of the fundamental problems and principles of neuroscience, emphasizing its multidisciplinary nature. Topics include nerve cell biology, nerve cell chemistry, central nervous system chemistry and disorders, visual perception's neural basis, developmental changes in nervous system tissue, and the neurobiology of motivated behaviors. Introduces the nervous system and how it may be studied, indicating the neuroscience resources available at Northeastern University. Includes lectures by specialists in each of these areas.

INT 3226 Topics in Neural Science
Offers lectures by specialists on central concepts, themes, and commonly used methodologies in neuroscience. Presents practical and theoretical aspects of neuroscience. Draws topics from current Society of Neuroscience Meeting Programs based on guest speakers' availability.

Graduate School of Boston-Bouvé College of Human Development Professions

All courses carry four quarter-hours of credit unless otherwise specified. Please see the current schedule for summer, fall, winter, and spring quarter listings.

Counseling Psychology, Rehabilitation, and Special Education

CRS 3400 Alternatives for Mainstreaming Individuals with Special Needs

Educates administrators, teachers, and specialists who are involved with mainstreaming individuals with special needs. Explores alternatives in decision-making and program development, implementation, and evaluation with members of various disciplines who provide services for special needs children.

CRS 3401 Educating Individuals with Learning Disabilities

Surveys behavioral and socio-emotional characteristics of children and youth who manifest specific defects in perceptual, integrative, or expressive processes that impair learning. Analyzes current service delivery programs, individual learning styles, and related curriculum materials for elementary through high school-aged, learning disabled students.

CRS 3404 Education of Individuals with Behavioral Disorders

Studies the various theories, programs, and approaches dealing with emotional disturbance. Emphasizes the role of the educator as it relates to the therapeutic management of individuals and groups displaying problems in socio-emotional development. Discusses parent-teacher interaction.

CRS 3405 Group Dynamics

Emphasizes understanding group growth, behavior, and action fundamental to developing solutions to the complex developing of group life. Teaches students to learn to examine their strengths and weaknesses, to examine group leadership styles, to become alert to new ideas and actions, to discover the pulse of a group, and to analyze reasons for one group's productivity and another's nonproductivity.

CRS 3407 Case Conferences: Individuals with Special Needs

Serves as a seminar in connection with the student's practicum. Examines and discusses case presentations by outstanding resource persons. Requires students to make their own case presentations to the seminar.

CRS 3408 Socio- and Psychodynamics of Family Life

Considers the internal and external dynamics of family life and the significance of such dynamics to the mental health of handicapped individuals and their families. Emphasizes the impact of disability on family functioning and integration. Explores approaches to working with parents of special needs groups from psychodynamic, social learning, and systems viewpoints.

CRS 3410 Review of Current Methodology and Research in Learning Disorders

Offers an advanced course to help develop the following competencies in relation to educating learning-disordered individuals (early childhood through adulthood); use of task analysis and learning style to develop comprehensive individual education plans; use of current research to evaluate techniques of intervention (for example, behavior modification and drug therapy

for hyperactive children); review of current research to evaluate assessment techniques (for example, effectiveness of available tests for learning disorders; ability to administer, score, and interpret tests useful in identifying learning disabilities; use of prescriptive techniques and materials for learning disabilities). May individualize selection of topics within competency areas for students, based on previous course work and experience. *Prereq.* CRS 3401.

CRS 3412 Psychology of Individuals with Special Needs

Studies the social and emotional adjustment of the handicapped and of the psychological significance of cognitive, sensory, and motor variations. Evaluates relevant legislation, the effects of limitations imposed by attitudes of society, the attitudes of individuals toward their handicaps, and the effect of the handicap itself. Discusses implications for educational programs and life span management. This course should be among the first taken in the Special Education sequence.

CRS 3415 Assessment in Special Education

Offers a field-based course that gives students the opportunity to learn to administer selected norm-referenced tests for special needs populations, determine which tests will yield the most information in a variety of case studies, and interpret data from a minimum of four norm-referenced test batteries.

CRS 3416 Diagnostic Prescriptive Teaching

Offers a field-based course that focuses on the understanding, development and implementation of individualized educational programs, including development of criterion-referenced tests, tasks analysis, annual goals, and short-range objectives; educational strategies and their application in classroom management; adaptation and selection of materials and strategies in various academic areas; perceptual-motor skills; and social-emotional interventions.

CRS 3417 Early Childhood Learning Problems: Identification and Program Development

Evaluates informal and formal screening and assessment procedures suitable for an early childhood population. Requires students to work with young children in order to acquire experience with screening and assessment techniques. May use the resulting information to develop programs to meet the needs of individual children.

CRS 3418 Special Education for Gifted Children

Considers identification, characteristics, and problems of gifted, creative, and talented children and youth. Emphasizes administrative and instructional adjustments needed to provide for this group of exceptional children.

CRS 3419 Practicum in Special Education: Fieldwork

Requires students to spend 250 hours in appropriate special education settings. Placements may be for one or two quarters. Requires attendance at seminars.

CRS 3420 Practicum in Special Education:**Student Teaching**

Requires students to spend a minimum of 300 hours in a placement that is appropriate for the certification sought (moderate or severe). Requires placement "in the role of" and "at the level of" certification sought (moderate, N-9 or 5-12; severe, all levels). Requires attendance at seminars.

CRS 3424 Etiology and Development of Special Needs

Explores factors that primarily affect deviations in cognitive, motoric, emotional, and physical development. Uses understanding of these factors to discuss multidisciplinary life-management issues. Discusses psychobiological, psychodynamic, and learning theory approaches and relates to problems of lifespan management.

CRS 3426 Seminar in Mental Retardation

Studies research in the field and its implications for teaching. Studies and evaluates intervention strategies.

CRS 3427 Seminar: Neuropsychology of Learning and Behavior Disorders

Through critical review of the literature, analyzes and discusses varied neuropsychological interpretations of the nature of learning and behavior disorders. Topics include biochemical and physiological correlates, cognitive and perceptual factors, genetic and maturational variables, hemispheric specialization, and implications of drug studies. Considers implications of the above for educating and serving special needs individuals as useful to administrators, teachers, counselors, reading specialists, school psychologists, and those in allied health fields. Expects students to give a presentation in an area related to the seminar topic. *Prereq.* CRS 3401.

CRS 3428 The Severely Handicapped

Reviews causes of handicapping conditions and considers the implications of severe multiple handicaps in home, educational, and community settings. Offers students a chance to develop a case study of a severely handicapped person in conjunction with reviewing relevant literature, visiting community facilities, and interviewing a family with a severely handicapped member.

CRS 3429 Assessment and Program Development for the Severely Handicapped

Includes observation of severely handicapped persons in the classroom and community; demonstration of evaluation and assessment techniques; and analysis of developmental, educational, and rehabilitation plans for severely handicapped persons.

CRS 3430 Behavior Management

Helps students design and implement behavior management programs for special needs children, youths, and adults. Synthesizes the various theoretical aspects of behavior modification in various field-based projects. Allows students to work with learning disabled, emotionally disturbed, or mentally retarded individuals to pinpoint target behaviors, chart baseline and intervention data, use appropriate reinforcement schedules

and reinforcers, and evaluate necessary program changes. Serves as field-based course required for all Moderate and Severe Special Education majors and recommended for students in School Psychology. *Prereq.* *Appropriate background in learning theory.*

CRS 3433 Introduction to Rehabilitation

Provides an overview of an orientation to the field of rehabilitation, including its historical development, legislative involvement, psychological implications, and sociological dimensions. Emphasizes coordinating and integrating services as they relate to the field of rehabilitation as a community process.

CRS 3434 Principles of Medical Rehabilitation

Explores the wide spectrum of disabilities that could profit from rehabilitation, including orthopedic, neurological, medical, surgical, and mental disabilities. Presents basic principles of medical rehabilitation that administrators should know. Discusses psychological aspects of disability.

CRS 3435 Program Development

Deals with program development for the physically handicapped, mentally retarded, emotionally disturbed, aging, welfare populations, youthful offenders, culturally disadvantaged, and other special community groups. Emphasizes the administrative involvement in developing and supporting the diagnostic, evaluative, counseling, and placement procedures used in such rehabilitation programs. Explores issues involving clinical program planning.

CRS 3436 Organization and Administrative Theory

Examines the body of conceptual knowledge regarding organizational and administrative theory. Examines formal and informal organizations, organizations as social systems, status and role concepts, leadership in organizations, power structure, relationships to authority, decision making, and communication in and between organizations.

CRS 3437 Community Planning

Presents what administrators need to know about community planning to develop programs in their areas. Examines basic principles of community planning, organization, and dynamics, as well as interdisciplinary relations. Studies examples of community planning from different agencies and the referral process among these agencies.

CRS 3439 Social Welfare and Rehabilitation

Attempts to acquaint administrators, counselors, and other human services personnel with the broad field of social welfare. Reviews the historical background of the relationship between vocational rehabilitation and social welfare and the more recent developments in the relationship of these fields.

CRS 3440 Program Evaluation

Emphasizes administrative research, program evaluation, and grantsmanship. Gives students the opportunity to develop a research design on some aspect of administration and carry out the necessary research operations involved.

CRS 3442 Fiscal Policy and Management 1

Introduces the concept of fiscal and managerial control. Covers accounting and budgetary procedures, need surveys, goal-setting practices, recruitment, staffing, training, professional development, caseload management, program planning, utilization of research, leadership patterns, performance appraisal, and external relationships. May use case method approach in classroom exercises.

CRS 3443 Administration of a Sheltered Workshop

Explores special problems of administering a sheltered workshop, such as community planning, work evaluation, job training, labor relations, contracting, production, and occupational placement.

CRS 3444 Fiscal Policy and Management 2

Examines understanding the fiscal management of the typical rehabilitation setting, including basic rehabilitation agency accounting, planned program budgeting, disbursements, cost analysis, contracting, taxation, forecasting, and funding. Covers the implication of data processing for fiscal management. Assigns special problems.

CRS 3445 Legal Aspects of Rehabilitation and Special Education

Sensitizes rehabilitation administrators, special educators, rehabilitation counselors, and other personnel to the impact of legislative developments upon the field of rehabilitation and special education. Emphasizes understanding the legal implications for rehabilitation of the latest Vocational Rehabilitation Administrative Amendments, workmen's compensation laws, eligibility determination criteria, and Social Security Amendments. Covers latest federal and state special education legislation.

CRS 3446 Occupational Placement

Studies the dynamics of moving the rehabilitation client into the world of work within the framework of the specific community structure. Considers development of facility in use of resource materials in occupational information, job description and analysis, performance appraisal, training, and vocational assessment. Discusses and analyzes the personnel point of view of the handicapped individual and develops more effective placement practices.

CRS 3448 CAGS Rehabilitation Practicum

Students are usually assigned to rehabilitation agencies where they are expected to spend 250 hours under appropriate supervision. A seminar with faculty members is conducted twice each quarter.

CRS 3449 Psychological Problems of Disability

Offers an advanced course in psychopathology as it relates to the impact of disability on personality. Studies in depth the moderately and severely handicapped from the viewpoint of psychosocial factors, interpersonal relationships, and cognitive versus noncognitive functioning in those with motor and sensory disabilities; problems of dependency and motivation; role of psychosomatic factors. Discusses the role of treatment and rehabilitation.

CRS 3450 Administrative Problems in Rehabilitation

Offers a seminar designed to analyze, in depth, critical issues and selected rehabilitation problems. Highlights operations and systems research as applied to rehabilitation. Uses institute research studies and studies available through social and rehabilitation services, completed research, and demonstrative projects.

CRS 3451 Essentials of Case Management and Supervision

Considers the relationship between case management and casework supervision. Topics include the dynamics of the communication process, decision making, conflict, resolution and compliance, management of resources external to the organization, structural and functional analysis of supervisory process, and caseload management.

CRS 3452 Rehabilitation of the Alcoholic and Drug Dependent

Studies comprehensive factors, including the nature of etiology dynamics involved in alcohol and drug dependency; techniques for evaluation; and rehabilitation administration, planning, and treatment.

CRS 3455 Critical Issues in Rehabilitation Administration

Explores and discusses the highly problematic issues of today's field. Among these issues are the breadth of the concept of disability, appropriate training sequences for the various rehabilitation disciplines, resolution of conflict over role overlap among disciplines, appropriate models for service delivery systems. The most current and relevant research may be brought to bear upon these areas, as well as knowledge from the reservoir of experience of instructors, visiting experts, and the student participants themselves. Students will be exposed to the issues as they exist in the profession and in the community. A theoretically oriented frame of reference will be brought to bear upon problems when feasible.

CRS 3460 (2 QH), CRS 3461 (3 QH), CRS 3462 (3 QH) Rehabilitation Administration Practicum, 1, 2, and 3

Assigns students to a variety of rehabilitation agencies for their practicum experience. Considers problem solving relevant to experiences encountered in internship. May include a seminar regularly conducted by a senior faculty member in conjunction with the practicum experience. Offers students an opportunity to share their fieldwork experiences and resolve problems in rehabilitation which are connected with their field placements.

CRS 3477 Evaluation of Deaf Rehabilitation Clients

Explores methods and techniques of psychological and vocational evaluation for deaf rehabilitation clients, including evaluation of client biographical characteristics, evaluation interview, and psychometric assessment. Required of all students in the deafness specialization of Rehabilitation Counseling Program. *Prereq.* CRS 3501 and SLA 3644.

CRS 3500 Foundations in Professional Psychology and Human Services

Provides a philosophical and theoretical background for beginning graduate students in counseling. Sharp-

ens the "self as instrument" through study and discussion of established theories of helping related to one's personal value system and through self-exploration and increased self-understanding in heretofore unexplored personal areas; introduces students to the broad spectrum of professional helping service areas with the intent of clarifying the students' professional roles; and begins to promote the development of a professional identity as a psychological helping professional.

CRS 3501 Psychological Testing

Discusses the principles and problems of psychological testing as applied to the work of the counselor. Considers technical concepts applicable to the use, understanding, and interpretation of test scores. Gives students the opportunity to become familiar with the most frequently used tests of intelligence, aptitude, achievement, interest, and personality. Evaluates tests for use in diagnosis and in understanding human behavior, with emphasis on their interpretation.

CRS 3502 Vocational Development and Occupational Information

Deals first, with theories about the ways in which individuals make decisions concerning their choice of vocation and second, with the kind of data needed to assist people with these decisions. Considers these requisite data in the relationship of social and economic change to occupational trends, the classification and description of occupational fields, methods of collecting, evaluating, filing, and disseminating vocational information, and the role of the counselor in fulfilling these functions.

CRS 3503 Counseling Theory and Process

Provides the student with a basic cognitive understanding of several major theoretical approaches to counseling. Helps students to become familiar with a wide range of individual counseling strategies, to develop listening, understanding, and communications skills, and to further probe their own self-understanding as counselors. Discusses and simulates these skills and understandings in the context of a variety of settings with a variety of clients. Uses role playing, case material, and audio and video materials. Open to degree and nondegree students with permission of the instructor during winter and spring quarters.

CRS 3507 Group Counseling

Introduces theories, principles, and techniques of counseling with groups of individuals at different levels of development and for varying purposes. Involves students in a genuine group counseling experience in order to understand the phenomenon of group experience. *Prereq.* CRS 3503 or permission of instructor.

CRS 3508 The College Student and the Campus

Examines the relationship between college students' behavior and their environment, with focus on students' rights, their social-emotional developmental concerns, and their search for identity. Examines the impact of societal forces and nontraditional patterns of learning on college curriculum options and discusses varying concerns of personnel services in different types of college climates, including the community college. Examines current issues in higher education

CRS 3517 Consultation Seminar

Offers a review of various consultation models, including behavioral consultation, process consultation, and systems consultation. Examines current research in the field of counseling consultation. Emphasizes the development of a personal consultation style and enhancement of consultation skills.

CRS 3518 Advanced Vocational Techniques

Focuses on career counseling issues, didactic instruction in career development theory, leadership of career development groups, and vocational/leisure counseling. Includes such learning activities as case studies, audio/video tapes in career counseling sessions, and class discussion of problems and their solutions.

CRS 3519 School Adjustment Casework

Offers students an opportunity to learn how to identify behaviors that interfere with a student's performance in school. Focuses on psycho-social evaluation skills and reviews therapeutic techniques for promoting insight and behavior change. Introduces the skills needed to organize and participate in teacher conferences and to act as a mental health consultant to teachers and parents. Review related areas of cultural and class factors, research in school phobias, abuse and neglect, drugs and alcohol, self-esteem, and special education laws and strategies.

CRS 3525 Family and Parent Counseling

Focuses on a conceptual understanding of family systems theory and its application to and implications for family counseling. Presents structural, communicative, and strategic approaches to marital, parent, and family counseling as the family is studied as an interactional system, as a seedbed of distress and health. Provides opportunity to become familiar with family assessment, counseling skills, and strategies. *Prereq.* CRS 3503.

CRS 3526 Seminar in Student Personnel Work

Explores, through case simulation and role plays, the legal, philosophical, and management theory bases for decision-making in the process of developing and administering student personnel programs in higher education. Emphasizes translating theory into practice via lectures, discussions, and the analysis of case study materials.

CRS 3527 Counseling Strategies for Children and Adolescents

Intended primarily for students who will counsel in school settings or other settings emphasizing work with children and adolescents. Considers a broad range of approaches, including but not limited to behavior modification, Adlerian, and Reality Therapy strategies. Emphasizes the development of strategies designed to help alleviate typical school-related and developmental problems such as nonachievement, decision making, negative self-identity, and disruptive behavior. Considers the counselor's role as a consultant to teachers, parents, and administrators in effecting positive behavior change. *Prereq.* CRS 3503.

CRS 3528 Vocational Counseling Strategies

Examines the individual's role expectations in the world of work from a human development perspective, and a systematic program to foster self-awareness will

be set forth. Views vocational counseling as dealing with the entire individual, including his or her values, underlying psychological needs and drives, and the influence of the environment on his or her level of development and career awareness. Includes counseling with females and nonachievers, the decline of the work ethic, community resource development, job placement, and information giving as a perceptual process. Intended for a variety of client populations from adolescence through adulthood. *Prereq.* CRS 3503.

CRS 3529 Rehabilitation Counseling Strategies

Emphasizes the roles and functions of the rehabilitation counselor, relevant issues in the field, and an overview of the rehabilitation process. Examines special problems and techniques of counseling with the disabled (physical, mental, and behavioral disorders) through case studies and role playing. Covers disability in the context of social deviance and psychosocial approaches to understanding human behavior, including self-concept, social role theories, and rational-behavioral approaches. *Prereq.* CRS 3503. *This prerequisite is waived for Rehabilitation Administration majors.*

CRS 3550 Psychological Counseling Strategies

Focuses on a variety of change strategies appropriate for older adolescents and adults. Intended for the student working with client populations in mental health settings and college counseling centers. *Prereq.* CRS 3503.

CRS 3551 Case Studies in Marriage and Family Counseling

Presents an advanced-level course for students with previous experience or preparation in marriage and family counseling. Emphasizes the preparation of case studies of family and marriage histories and current functioning; the design of service, counseling, and referral programs based upon comprehensive studies of needs and resources; and the practice of counseling strategies through role playing, taped interviews, and progress reports of current counseling activities. *Prereq.* CRS 3525.

CRS 3532 Seminar in School Psychology

Provides an intensive analysis of philosophical, technical, and school administrative issues contributing to the professional identity and consultative function of the psychologist in an educational milieu. Uses simulations, case studies, and research projects to study these issues. *Prereq.* *Permission of instructor.*

CRS 3533 Psychoeducational Prescriptions

Recommended for all school counseling majors and required of all school psychology majors. Provides training and supervision in synthesizing data on a student's cognitive, affective, and interpersonal needs with educational plans which are based directly on that data; may be implemented in the school setting; and meet the 766, PL94-142 criteria for such plans.

CRS 3534 Individual Intelligence Testing

6 QH

Offers preparation to administer, score, and interpret the Stanford-Binet Intelligence Test, the Wechsler Adult Intelligence Test, and the Wechsler Intelligence Scale for Children. Considers the theories of intelli-

gence upon which the tests are based and the use of the tests in educational and clinical settings. Requires students to administer, score, and interpret tests, including some from each of the three tests covering in the course. *Prereq.* CRS 3501.

CRS 3535 Seminar in Contemporary Issues in Counseling

Offers intensive study of a selected topic in counseling such as multicultural counseling, feminist therapy, child therapy, or adult development. May include a review of the literature, skill building, action projects, or critical analytical papers.

CRS 3536 Advanced Group Counseling

Follows CRS 3507 but emphasizes developing skill in leadership at a variety of ages. Pays greater attention to relevant readings and research on group process and group dynamics. *Prereq.* CRS 3507.

CRS 3537 Seminar in Counseling Supervision and In-Service Education

Considers theory and practice of the supervisory process as it applies to the evaluation of counselor effectiveness and professional development. Requires theory readings, discussions, role playing, and plans for in-service staff development, but the major activity of the course involves the use of audio and videotapes of actual supervisory sessions conducted by class members (access to actual or simulated supervision clients is an assumed requirement). *Prereq.* *Master's degree in counseling or permission of instructor.*

CRS 3538 History and Systems of Psychology

Offers an advanced-level counseling course required of all counseling psychology students in the master's, CAGS, and doctoral programs. Designed to expose students to the major historical ideas in western culture that underlie modern psychological theories, methods of human behavior change, and concepts of science. Reviews fundamental steering concepts to give students deepened perspective on the state of contemporary counseling psychology by showing how the historical past has shaped current thought, and to suggest possibilities for development in psychology. *Prereq.* CRS 3530.

CRS 3539 Contemporary Theories of Psychotherapy

Required of all CAGS students. Continues the in-depth focus on the conceptual clinical elements of contemporary psychoanalytic, cognitive, social learning, existential and systemic theories of personality and behavior change. Includes selected readings, lectures, and student discussion. Aims to develop an appreciation for issues involved in the evaluation and future directions of contemporary theoretical schools, and to consider which types of therapies may be suitable for certain types of clients at specific periods of their lives, as well as to critically examine the gender, class, and culture adequacy of theory. *Prereq.* CRS 3538.

CRS 3540 Advanced Psychodiagnostics

Offers an advanced course in psychodiagnostic testing, focusing on the Rorschach test. Teaches the administering, scoring and the basics of interpreting this test, using the Exner scoring system. Integrates Rorschach data with data from other sources, such as personal

history data and other projective tests. Trains students in providing clear, pertinent feedback and recommendations. Assumes a rudimentary knowledge of the theory and practice of psycho-diagnosis. *Prereq.* CRS 3501, CRS 3534, and CRS 3541.

CRS 3541 Psychodiagnostic Measures

Offers an advanced-level course in clinical assessment. Places heavy emphasis on differential diagnosis and personality description using data from a variety of sources—interviewing, case histories, and objective and projective testing. May include the California Psychological Inventory, Minnesota Multiphasic Personality Inventory, Bender-Gestalt and Sentence Completion Tests, and Draw-A-Person Test. Requires students to administer and interpret psychological test data and to report their findings in a psychological report. *Prereq.* CRS 3501 and CRS 3534.

CRS 3551 Legal, Ethical, and Professional Issues in Counseling and Mental Health

Provides a systematic orientation to the moral, legal, ethical, and professional issues found by mental health practitioners in their teaching, research, and practice. *Prereq.* Doctoral standing or permission of instructor.

CRS 3552 Cross-Cultural Counseling

Helps students develop beliefs/attitudes, knowledges, and skills that will contribute to their becoming culturally sensitive in their counseling and assessment practice. *Prereq.* CRS 3503 or permission of instructor.

CRS 3553 Human Neuropsychology 1

Explores brain/behavior relationships and acquaints students with the language and frame of reference of neuropsychology. Introduces neuroanatomy, the topography of the cerebrum, brain stem, and cortospinal system. Covers different theories and approaches to understanding brain/behavior relationships and significant clinical disorders such as alcoholism, aging, epilepsy, language deficits and apraxias, and last, memory disorders and learning disabilities. *Prereq.* CRS 3501 and CRS 3534.

CRS 3554 Human Neuropsychology 2

Describes neuropsychological assessment of adults and children, a rationale for undertaking such an evaluation, the sorts of questions or topics that can be addressed, and appropriate tests and techniques. Covers topics such as laterality, effects of psychiatric disorders, and childhood disorders through a critical review of the literature and research. *Prereq.* CRS 3553.

CRS 3555 Child Psychotherapy

Provides students with a basic understanding of child development, psychopathology, and modes of psychotherapy with children. Addresses the importance of working with parents and with school systems and, through class discussions and readings, give students a sense of how to consult with parents and schools. *Prereq.* CRS 3503 or permission of instructor.

CRS 3556 Feminist Therapy

Introduces the psychology of women, sex roles, gender socialization, and feminism at an intermediate level. Emphasizes the analysis of traditional personality

theory, psychopathology, and treatment from a feminist perspective. *Prereq.* CRS 3501, CRS 3503, and CRS 3530, or permission of instructor.

CRS 3557 Counseling Adults and Families over the Life Span

Utilizes a combined didactic and seminar presentation to develop understanding of life span biopsychosocial issues in adulthood and the implications for counseling adults as they pass through the stages of human development and reciprocal impacts of individual, family, and career. Gives special attention to gender, class, racial, and cross-cultural variables affecting individual and family functioning in larger social systems. Studies clinical interventions in the context of contemporary psychological theory and research. *Prereq.* CRS 3503 and CRS 3525.

CRS 3558 Doctoral Seminar in Counseling Psychology

Seeks to prepare doctoral students to critically analyze their discipline and profession at an advanced level. Identifies and analyzes current research findings, professional trends and disciplinary assumptions. *Prereq.* Permission of adviser.

CRS 3559 Community Psychology

Introduces the history and conceptual base of community psychology. Discusses crisis theory, prevention, and ecological systems theory. Presents consultation skills, model community programs, and women's and minority issues. *Prereq.* Open to doctoral and CAGS students in counseling psychology and school psychology, or permission of instructor.

CRS 3560 (2 QH), CRS 3561 (3 QH), CRS 3562 (3 QH)
Counseling Psychology Practicum 1, 2, 3

CRS 3563 (2 QH), CRS 3564 (3 QH), CRS 3565 (3 QH)
Industrial Practicum 1, 2, 3

CRS 3566 (2 QH), CRS 3567 (3 QH), CRS 3568 (3 QH)
School Counseling Practicum 1, 2, 3

CRS 3569 (2 QH), CRS 3570 (3 QH), CRS 3571 (3 QH)
Student Personnel Practicum 1, 2, 3

CRS 3572 (2 QH), CRS 3573 (3 QH), CRS 3574 (3 QH)
Rehabilitation Counseling Practicum 1, 2, 3

Offers a supervised counseling experience extended over the academic year. In the fall, emphasizes small group seminars dealing with counseling and other related matters. In the winter and spring quarters concentrates on the supervised counseling assignment. Assigns practicum settings according to the student's major area of concentration. Requires students to make themselves available a minimum of two days per week during the academic year (October to June) for placement in a field setting. Stresses materials germane to the student's major and meets a total of twenty-four times during the year. Each practicum must be successfully completed prior to commencing the next. *Part-time students must submit an application for practicum (available from the department) by April 1, for approval to enroll in the practicum the following fall quarter. Prereq.* CRS 3503 (may be taken concurrently with the beginning of practicum).

CRS 3575 (2 QH), CRS 3576 (3 QH), CRS 3577 (3 QH)**School Psychology Fieldwork 1, 2, 3**

Presents the first phase of a two-year sequence of supervised fieldwork required for school psychologist certification. Places students in an N-12 school system working under the supervision of a certified school psychologist. Continues for two days a week across the academic year from September to June. Allows students to perform psychological evaluations and participate in other appropriate activities. Includes seminars that meet for twenty-four sessions during the year to provide skill training and discuss role functions. Gives students one hour of supervision per week from the field site supervisor. *Students must submit an application for a fieldwork placement by April 1 for approval for the course that begins in the following fall quarter. Prereq. Approval of adviser.*

CRS 3578 (2 QH), CRS 3579 (3 QH), CRS 3580 (3 QH)**School Psychology Fieldwork 4, 5, 6**

Involves the second phase of a two-year sequence leading to eligibility for application for school psychologist certification. Assigns students to a different N-12 grade placement from the first experience to provide a diversified experience. Offers placement for two days per week from September to June. Includes seminars that meet twenty-four times across the academic year and consist of case presentations, skill and strategy training, and discussions of case management. Provides for students to work under and receive one hour of supervision from their certified school psychologist site supervisor. *Students must submit an application for fieldwork by April 1 for approval to enroll in the fieldwork course the following fall quarter. Prereq. CRS 3575, CRS 3576, and CRS 3577.*

CRS 3581 (2 QH), CRS 3582 (3 QH), CRS 3583 (3 QH)**Advanced Fieldwork 1, 2, 3**

Required for all CAGS students. Involves fieldwork placement consistent with students' major professional goals and/or the settings in which they intend to work. May extend across the academic year from September to June and require a minimum of two days per week, or the equivalent, in the fieldwork setting. Includes seminars that will meet, subject to change, on alternate weeks with additional individual supervision on campus. Provides supervision in the field setting. Requires all quarters to be completed before credit will be given for the course. *Prereq. Counseling practicum or equiv. in experience.*

CRS 3612 Psychoeducational Assessment and Screening of Preschoolers

Focuses on the psychological and educational assessment of preschoolers as conducted by school psychologists. Discusses history, issues, and current status of preschool assessment. *Prereq. Open to CAGS students in school psychology who have completed introductory assessment course, or permission of instructor.*

CRS 3615 Student-Staff Development for College Student Personnel

Explores a variety of models for understanding student and staff development in student personnel services. Focuses on assessing developmental needs and

designing, delivering, and evaluating educational programs which address those needs. Gives special attention to understanding diversity within student and staff populations. Examines significant life experiences that affect individual development patterns including race and ethnicity, gender, age, disability, and sexual orientation. *Prereq. CRS 3508.*

CRS 3620 Fundamentals of Human Resource Counseling

Develops students' understanding of human resource counseling as a rapidly developing area of applied Psychological work in a variety of organizational settings. Considers human resource counseling as a potentially significant social movement for facilitating employee well-being and occupational competence. Surveys basic applied psychological practices employed in human resource development programs. Considers future trends in human resource program development as well as the continuing educational needs of professional counselors. *Prereq. CRS 3501 and CRS 3503.*

CRS 3630 Workshop in Career Development

Focuses on planning and implementing career-development programs for adolescents and adults in schools, colleges, and community-based agencies. Introduces theoretical material on life stages, vocational development, and justifications for career education. Emphasizes the practical techniques presented by successful practitioners. Requires students to develop a program plan for "backbone" implementation.

CRS 3631 Workshop School Adjustment Practice

Focuses on participants' own experiences in work with children and families, the school system, and the community. Uses the case study as problem-solving approach to analyze, explain, and remediate a "presenting problem" within a diagnostic-prescriptive framework. *This course is designed for school adjustment counselors who are currently employed in a Massachusetts school system or similar youth workers in other schools or agencies.*

CRS 3632 Workshop in Peer Counseling in Schools and Colleges

Explores the philosophy and techniques of training students as counselors for other students. Investigates methods of introducing peer counseling programs to schools and colleges. Offers techniques for presenting the concept to administrators. Provides experience in the group model of peer-counselor training. Requires a research paper that directly applies peer counseling to student's area of professional interest.

CRS 3633 Workshop in Reality Therapy

Offers practice in applying reality therapy principles and gives assistance in developing a plan to implement principles in professional work. *Designed for teachers, administrators, and human service professionals in health, including counselors, psychologists, nurses, and therapists.*

CRS 3800 Directed Study

Provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. *Not available to special students. Prereq. Approval of the*

chair of the department and of the director of the graduate school. Approval forms must be submitted during the quarter prior to registration for the directed study.

CRS 3801 Thesis 8 QH

Involves a research activity that may be selected by the student in lieu of two courses (8 QH), with the approval and recommendation of the adviser.

CRS 3803 Institute in Counselor Education
(See general institute description on page 74.)

CRS 3804 Institute in Rehabilitation Administration
(See general institute description on page 74.)

CRS 3805 Institute in Special Education
(See general institute description on page 74.)

CRS 3806 Workshop in Counselor Education
(See general workshop description on page 74.)

CRS 3807 Workshop in Rehabilitation Administration
(See general workshop description on page 76.)

CRS 3808 Doctoral Dissertation
Prereq. Admission to candidacy in the Doctor of Education degree program.

CRS 3850, CRS 3851, CRS 3852, CRS 3853, CRS 3854, CRS 3855 2 QH each

Internship in Counseling Psychology 1, 2, 3, 4, 5, 6
Required of all doctoral students in counseling psychology. Determines field placement by Internship Com-

mittee based upon individual professional goals and experience. Requires a minimum of twenty hours per week for eighteen months for a total of 1,500 clock hours in the internship setting. Provides for students to register for CRS 3850 through CRS 3855 for a total of twelve quarter hours. Involves campus meetings held at least eight times a quarter on a group basis for all interns. Provides on-site supervision for at least two hours per week on an individual basis. *Prereq. CRS 3581 or equiv. in experience approved by the Internship Committee.*

CRS 3856, CRS 3857, CRS 3858 4 QH each
Internship in Counseling Psychology 1, 2, 3

Required of all doctoral students in counseling psychology. Determines field placement by Internship Committee based upon individual professional goals and experience. Requires a minimum of forty hours per week for nine months for a total of 1,500 clock hours in the internship setting. Provides for students to register for CRS 3856 through CRS 3858 in subsequent quarters for a total of twelve quarter hours. Involves campus meetings held at least eight times a quarter on a group basis for all interns. Provides on-site supervision by a supervisor from the field site for at least two hours per week on an individual basis. *Prereq. CRS 3581 or equiv. in experience approved by the Internship Committee.*

Education

ED 3300 Psychology of Learning
Compares basic principles of learning, acquisition, retention, and transfer. Considers the applications of these principles in a variety of areas, for example, child rearing, schooling, rehabilitation. *Suggested prereq. A course in psychology.*

ED 3301 Psychology of Thinking
Surveys the processes involved in cognitive organization and functioning. Focuses on reasoning, concept attainment, and problem solving. Reviews strategies for enhancing cognitive functioning. *Suggested prereq. A course in psychology.*

ED 3302 Psychology of Personality
Considers the personality theories of Freud, Jung, Adler, Sullivan, Horney, Cattell, Allport, Rogers, and other approaches, including the psychosomatic of Alexander and the work of Reich. Examines theories in depth for ways that contribute to an understanding of dynamic factors in personality formation. Compares theories and theorists for a greater understanding of strengths and weaknesses. Discusses social, cultural and philosophic questions. Considers implications of some of the ideas and theories for the therapeutic process. *Suggested prereq. At least one course, and preferably more, in psychology.*

ED 3303 Theories of Developmental Psychology
Reviews representative developmental theories. Compares and analyzes key aspects of these theories with a focus on educational implications. *Instructor permission required.*

ED 3304 Child Psychology
Surveys principles of child development from the prenatal period through preadolescence. Reviews physical, cognitive, language, social, and personality development in the context of relevant theory. Considers educational implications.

ED 3305 Adolescent Psychology
Examines social, emotional, and intellectual development in the adolescent years. Studies problems in family relationships and in adolescents' social environment as well as their adjustment in school.

ED 3306 Abnormal Psychology
Presents a historical overview that leads to contemporary views on how human personality becomes disordered and maladaptive. Emphasizes the development of psychopathology during the course of development, including a perspective for viewing the economy of psychological deviations. Considers neuroses, transient states, character disorders, sexual deviations, psychophysiological reactions, drug and alcohol addictions, and psychotic reactions, each with a

clinical picture, typical course, and outcomes. Considers current methods of diagnosis and treatment. *Prereq.* *Permission of instructor.*

ED 3307 Adult Psychology

Explores the three major areas of adulthood (young adulthood, middle age, and old age) in a context of research findings, academic knowledge, and clinical findings.

ED 3308 Seminar in Child Development

Presents a seminar course with emphasis on discussion of critical issues in child development. Allows for students to select topics, review and evaluate research, examine the relevance of the research to educational theory and practice, and present their findings and conclusions to the seminar. *Prereq.* *A course in child psychology or human development.*

ED 3309 Seminar in Adolescent Development

Presents a seminar course with emphasis on discussion of major problem areas facing the adolescent in our society. Stresses social and emotional development. Includes a survey of research. *Prereq.* *A course in adolescent psychology or human development.*

ED 3310 Personality and Social Structure

Considers human behavior from a combined psychodynamic and sociological point of view, with special emphasis on socialization and the relations between the individual and the collectivity. Examines the integration of relevant theories from psychology, sociology, and anthropology. *Suggested prereq.* *A course in sociology, cultural anthropology, or social psychology.*

ED 3311 Sex Roles in Education

Identifies and examines some of the major issues related to sex roles in both the formal and informal educational systems of our society. Topics include development of sex role patterns in the home and preschool and through children's books, games, and television programs; life for boys and girls in the elementary and high school classroom; sex bias in counseling and in vocational guidance and training; changes in traditional family roles and occupation hierarchies; assets and liabilities of coeducational and single-sex education. May also allow students, in small groups, to explore their own sex role attitudes and the strategies they use to socialize young people.

ED 3312 Communications Theory

Introduces communications theory, covering models of the communication process, attitude changes, information, innovation, dissemination and flow, communication modalities, and language processing.

ED 3320 Sociology of Education

Considers the functioning of educational institutions in their social and cultural milieu will be examined from anthropological and sociological perspectives: the school as a social system; influence of the stratification system, youth cultures, and racial antagonisms upon the educational enterprise.

ED 3321 Educational Anthropology

Examines schooling as a particular variety of socialization, with special attention to characteristics of societies that rely heavily on formal instruction, contrasted with less deliberately patterned techniques of child rearing. Includes readings that will be mainly cross-cultural, ethnographic, and historical.

ED 3324 Comparative Education

Introduces education in other nations and exploration of its relationships with the political, economic, social, and cultural milieu. Considers selected countries in Western and Eastern Europe, South America, and Africa.

ED 3325 History of Education

Explores some of the historical roots of contemporary educational theory and practice with a focus on selected aspects of educational history from antiquity to the present. Utilizes knowledge gained for the development of a personal educational position.

ED 3326 Topics in the Philosophy of Education

Studies the basic assumptions underlying statements of educational content, process, and aims. Selects materials to be subjected to philosophical analysis from educational and philosophic writings according to themes (for example, authority and freedom, "growth" as an educational objective, the nature of educational relationships). Varies from quarter to quarter, depending on the concerns and interests of students and instructor. Includes brief lectures, mostly discussion.

ED 3327 Seminar in Contemporary Issues in American Education

Discusses selected issues in contemporary American education such as school desegregation, compensatory education, learning problems of the disadvantaged, professionalization of teachers, etc. Reviews relevant research and opinions. The topic or topics of the seminar will be announced in the registration materials distributed in advance of that quarter.

ED 3328 Education and Equality

Investigates the reciprocal relationship between American educational institutions and the equality-inequality dimension of American social structure. Discusses both the traditional view, which celebrates the American public school as a triumph of equalitarianism, and the revisionist view, which emphasizes inequalitarian consequences of American educational practice.

ED 3340 Introduction to Educational Statistics

Studies basic descriptive statistics for measurement and research. Topics include use of statistical notation, measures of central tendency and variability, probability and sampling techniques, theoretical distributions, linear regression and correlation, and an introduction to statistical inference. *This course, or completion of a statistics proficiency examination, is required for admission to ED3342.*

ED 3341 Intermediate Educational Statistics

Explores statistical inference of normal populations and discrete data; estimation; testing of hypotheses;

multiple correlation; analysis of variance and covariance; contingency; the chi-square test and other non-parametric tests. Emphasizes application in educational research. *Prereq.* Successful completion of the statistics proficiency examination; satisfactory completion of ED 3340 or permission of instructor. This course must be completed prior to doctoral candidacy.

ED 3342 Research Design in Education

Introduces scientific methods of research in education and related fields. Stresses critical reading and understanding of research literature, formulating research hypotheses, constructing a research proposal, and carrying out an individual or group project. Must be included among the first six courses taken by each student. *Prereq.* Satisfactory completion of the statistics proficiency examination or satisfactory completion of any graduate-level statistics course offered by Boston-Bouve College (Students wishing to make arrangements to take the proficiency examination should call 617-437-3302.)

ED 3343 Advanced Research Design

Focuses on methodologies for collecting, interpreting, and evaluating data and deals with biases encountered in the data-collection process. Topics include data collection and interpretation, use of sampling, analysis of variance, covariance, multiple regression, multivariate procedures, and advanced topics in scaling, semantic differential methodology, questionnaire design, interview methodology, and evaluative criteria. Requires students enrolling for this course to design and complete a proposal on this design for the conduct of a research project, which may be carried out as part of a research on either the master's or doctoral level. *Prereq.* ED 3341, equiv., or permission of instructor.

ED 3344 Nonquantitative Research Methods in Education

Considers nonquantitative research methods in the human development professions. Topics include problem formulation, location and selection of data, authenticity of sources, and analysis of data by synthesis. Discusses case-study approaches and style of writing for research proposals. *Prereq.* ED 3341.

ED 3345 Nature and Theory of Psychological and Educational Measurement

Examines the logic of measurement and the nature of human capacities, aptitudes, and abilities. Reviews characteristics of tests, ratings, questionnaires, and similar instruments with emphasis on their reliability, validity, and utility. Covers item analysis procedures and test standardization.

ED 3346, ED 3347 Independent Research Seminars 1, 2 4 QH each

Focuses on the design, conduct, analysis, and reporting of data from an individual research project. May be original or secondary, applied, theoretical, or action research and must be substantially larger in scope than that accommodated by directed study. Involves evaluation that will be based on oral and written interim reports in ED 3346 and oral and written final reports in ED 3347. Will serve as an option to the thesis requirement only for students enrolled in the master's degree program in educational research.

ED 3348 Research and Statistical Methods for Administrators

Studies the application of the methods of research and statistical techniques to problem solving, with specific focus on the role of research in the administrative decision-making process. May also focus on the various research designs administrators may use in their positions, such as the development of a program proposal for local, state, or federal agencies. Provides for students to select a specific topic of practical significance in administration by the student and develops a design for studying the topical problem. Evaluates research relevant to the topic. *Suggested prereq.* Rudimentary knowledge of research designs and techniques and an elementary knowledge of basic statistical methods.

ED 3349 Computer Applications of Multivariate Statistics

Explores concepts, applications, and interpretation of data analyses using the VAX computer and BMDP software package. Provides data to students and asks them to perform and interpret data analyses using statistical procedures including: multivariate analysis of variance and covariance, multiple regression, linear and multiple discriminant analysis, factor analysis and rotational techniques, and canonical correlation. *Prereq.* ED 3341.

ED 3400 Analysis of the Instructional Process

Considers the rational basis for effective teaching and the nature of the educational process. Relates learning theory to the various strategies and activities that can be implemented within a learning situation to meet the needs of the learners, including those with special needs. Employs alternative approaches, research results, and theoretical constructs to help extend the prospective teacher's understanding of the educational process and the role of the teacher in it. *Requires fifteen hours of fieldwork. Open to students in teacher certification program.*

ED 3401 Fundamentals of Curriculum Development

Examines how goals and objectives are selected and how priorities are determined. Considers methods of designing educational programs to meet specified goals and methods of evaluating educational outcomes in terms of the goals of the program and techniques for modifying programs in the light of such performance.

ED 3402 Methods and Materials for Teaching Children 1

Examines teaching methods and learning materials used in teaching children in a number of educational settings. Helps students establish objectives, plan and execute appropriate learning experiences, and effective outcomes. Focuses on writing skills, art, music, movement, and social studies. *Requires fifteen hours of fieldwork. Open to students in teacher certification program.*

ED 3403 Methods and Materials for Teaching Children 2

Provides a continuation of ED 3402. Focuses on physical and natural science, mathematics, health and nutrition. *Requires fifteen hours of fieldwork. Prereq.* ED 3402. *Open to students in teacher certification program.*

ED 3404 Methods and Materials for Teaching Adolescents and Adults 1

Considers specific methods and materials appropriate to teaching adolescents and adults. Develops in the students an understanding of the teaching and learning process, encourages attitudes conducive to and identified with good tenets of teaching, and fosters acceptance of the need to grow constantly and to be aware of the continuing development of our knowledge of the learning-teaching process. *Requires fifteen hours of fieldwork. Open to students in secondary teacher certification program.*

ED 3405 Methods and Materials for Teaching Adolescents and Adults 2

Provides for the specific subject areas to be attended to. Topics include organizing and presenting lessons, developing teaching materials, using audiovisual equipment, developing and implementing evaluation instruments, and selecting appropriate materials within each field of interest. *Requires fifteen hours of fieldwork. Open to students in secondary teacher certification program. Prereq. ED 3404.*

ED 3406 Procedures of Evaluation

Considers evaluation as a process for the improvement of learning and instruction. Topics include how to measure and evaluate affective, psychomotor, and cognitive dimensions of student growth; test construction; selecting and administering standardized tests; various bases of grading; and methods of reporting student progress. *Open to students in teacher certification program.*

ED 3407 Student Teaching with Related Seminar 8 QH

Offers a University-arranged practicum of observation and teaching in schools offering comprehensive programs within reasonable commuting distance of the University. Participating on a full-time basis requires the student to develop planning and communication abilities within his major field. Includes biweekly seminars at the University to analyze theory-practice relationships and to examine generic problems of teaching. *Prereq. Course in child or adolescent psychology; successful completion of all course work in the nondegree program. Open only to students in the nondegree teacher certification program.*

ED 3408 Evolution of Curriculum Theory and Practice

Examines from a historical perspective the curriculum of the American school as an evolutionary process resulting in part from conflict between subject-oriented and student-oriented curricula, traditionalists and revisionists, behaviorism and psychodynamism, and the interplay of forces generated by students, teachers, administrators, and other interested groups. Analyzes current curricula as the outcomes of such influences and trends for future developments will be hypothesized. Focuses on the process of curriculum development and the product of that development.

ED 3409 Seminar in Curriculum: Alternative Designs

Identifies and analyzes problems in curriculum and instruction in light of the forces affecting the curriculum within the student's area of specialization; design and implementation of solutions to such problems;

evaluation and field testing, where feasible. *Prereq. ED 3408.*

ED 3410 International Perspectives on Curriculum Planning and Development

Involves students in assessing cross-cultural curricular planning and development, assumptions underlying particular principles, and the process and problems that are related to curriculum organization in developing, industrialized, and agrarian societies. Provides for students to establish criteria for experientially based curriculum in both formal and informal educational settings and to apply the criteria developed to assess curricular patterns already in existence and to new models that they develop to meet academic and societal needs within their own cultures.

ED 3411 Seminar in Instruction: Alternative Designs

Considers methods of inventing or adapting methods of teaching to make them appropriate to the demands of the curriculum, the needs of the students, the capabilities of the teachers, the expectations of the community, and the resources of the school or college. Helps the student identify the criteria by which instructional practices may be selected, by which they may be evaluated, and by which they may be developed. Includes methods of teaching, designing learning materials, grouping students, pacing, scheduling, and evaluating. Gives students the opportunity to revise existing resources and to create new resources for instruction in order to make the implementation of a specific curriculum effective. *Prereq. Students not in joint programs with a department in another college take ED 3409 (may be taken concurrently); students in joint programs with a department in another college take ED 3400.*

ED 3412, ED 3413 Seminar in the State of the Art and Field Project 4 QH each

Examines the current curricular and instructional issues in specific teaching areas or levels, hypothesizing and projecting possible future directions in curriculum and instruction in these areas; integration of the results of these inquiries into coherent understandings of the state of the art in these areas and the development of a special project to be implemented by the students within the context of their own teaching experiences. Includes seminars to be held over a period of two quarters every other week. *Prereq. Teaching experience.*

ED 3414 Seminar in Supervision of Instruction/Reading

Examines the role of the supervisor and consultant in organizing and implementing programs. Includes organizational plans, staff supervision and development, working with parents, and accommodating special needs children.

ED 3415 Seminar in Supervision of Instruction Practicum 6 QH

Allows students to apply the skills learned in the seminar to a field setting. Provides for student fieldwork to be supervised by an on-site person and a professor. Offers periodic seminars where projects are selected and discussed. Provides for students to plan

the projects and implement these in the field and to plan and carry out a project evaluation.

ED 3420 The English-Language Arts Curriculum

Considers the design and function of the English-language arts curriculum; selected current issues as they impinge upon the English language arts curriculum; the design and function of research in the English-language arts curriculum. *Open to certified or experienced teachers. Prereq. Permission of instructor.*

ED 3421 Literature in the English-Language Arts Curriculum

Explore the historical-social, psychological, personal, archetypal, textual, biographical, and philosophical-moral aspects of literary study and their relation to the chronological, thematic, and generic demands of the literature program; sources in literature as they relate to the young reader and the implications for the English-language arts curriculum; the interrelatedness of literature and other components of the English-language arts curriculum. Allows students to identify and investigate areas of individual interest. *Prereq. ED 3420.*

ED 3422 Writing in the English-Language Arts Curriculum

Considers the cognitive and effective bases of imaginative and nonimaginative writing; the role of writing in the relationship between self and object; modes of imaginative and nonimaginative writing appropriate to the young writer; the impulse to expression in the young writer and its implications for the English-language arts curriculum; the interrelatedness of writing and other components of the English-language arts curriculum. Allows each student to identify and investigate an area of individual interest. *Prereq. ED 3420.*

ED 3423 Language in the English-Language Arts Curriculum

Examines the multiple dimensions of language study in the English-language arts curriculum; the role of inquiry in the study of language and its implications for the English-language arts curriculum; theories of grammar and their relation to the study of language in the English-language arts curriculum; the interrelatedness of language and the other components of the English-language arts curriculum. Allows each student to identify and investigate an area of individual interest. *Prereq. ED 3420.*

ED 3424 Topics in English-Language Arts Education

Investigates a matter of immediate concern to English-language arts education, but for which no organized study is ordinarily available. Topics include media in the English-language arts program, behavioral objectives in the English-language arts program, the English-language arts program for the disadvantaged. Announces seminar topic prior to registration.

ED 3425 English as a Second Language 1

Serves as a first course in teaching ESL, introducing the basic linguistic, cultural, and psychological concepts. Analyzes current approaches to teaching ESL locally and internationally from the standpoint of diagnosis, grouping, use of particular methods, and materials. Includes observations of local ongoing ESL programs. *Prereq. ED 3453.*

ED 3426 English as a Second Language 2

Continued ED 3425. Develops specific projects according to student need and interest and includes supervised clinical work. *Prereq. ED 3425.*

ED 3427 Literature and Materials Seminar

Examines literature for children, adolescents, and adults; the sources of interest in literature as they relate to the reader; the interrelatedness of literature and other components of the language arts program; investigation of materials available. Allows students to develop projects related to their needs and interests.

ED 3430 History and the Social Studies in the School Curriculum

Permits the student to explore some of the fundamental concepts of anthropology, sociology, economics, political science, and history. Emphasizes the interrelatedness of disciplines and to the extraction of operating principles from those that aid in the analyses of social problems. Equips students to find a greater variety of conceptual relationships within the historical social science field, and from there a framework for evolving courses of study may be generated. *Prereq. Teaching experience or certification.*

ED 3431 Social Science Materials Seminar

Presents a curriculum course wherein the knowledge previously acquired will be used to establish criteria for the selection and development of curriculum materials. Views all materials of instruction as means of implementation of objectives relating to specific social science concepts and skills. Tries to personalize and concretize abstract phenomena and to demonstrate their impact on the quality of human lives. Allows students to examine and analyze prepared curricula and will be asked to develop original materials that include provision for the integration of a variety of thinking, reading, and social skills. *Prereq. Teaching experience or certification.*

ED 3432 Seminar in Current Issues in the Social Studies

Employs a content approach to problems of political, economic, and social significance which have contemporary relevance for teachers of the social sciences.

ED 3440 Remediation in Mathematics

Studies an effective approach to the teaching of mathematics; diagnosis and remediation of difficulties, alternative teaching methods, techniques for the improvement of student skills and of student attitudes toward mathematics.

ED 3442 Seminar in Mathematics Education

Requires students to analyze a mathematics learning problem, to investigate relevant research, and to prepare materials embodying their own proposed solutions. *Prereq. Permission of instructor.*

ED 3444 Implementing Change in Science and Mathematics Education

Considers the planning, organization, and execution of in-service experiences for teachers, related to all phases of science and mathematics education from subject matter courses to curriculum planning to materials workshops. *Prereq. Teaching experience or certification.*

ED 3450 Foundations of Developmental Reading

Examines reading and writing as the receiving and generating of language; current developmental reading, writing, and related language skills; selected research findings bearing on relevant topics. Includes ten hours of observation or other field experience for students in the Consulting Teacher of Reading Program only.

ED 3451 Language and Reading

Introduces linguistics with emphasis on implications for reading and language instruction. Topics include the nature of language, introduction to the development of syntax, phonology and semantics, English orthography, the grammar of child language, and dialectology. *Prereq.* ED 3450.

ED 3452 Current Issues in Reading and Language

Presents three or four topics of current interest in reading and language education are investigated in depth over a three- or four-week period each during the quarter. Topics include lectures and reading on sexism in reading materials, Chapter 766 and its implications for reading and language education, "back to basics reading and language in the open and alternative education program, problems of illiteracy, bilingual and bicultural education and reading/language instruction".

ED 3453 Diagnosis and Remediation of Reading and Language Disabilities 1

Explores reading and language disabilities; causes and correlates of disability; language differences; aspects of measurement; diagnostic and corrective procedures in reading, writing, and related language skills; selected research findings bearing on relevant topics. *Prereq.* ED 3450.

ED 3454 Diagnosis and Remediation of Reading and Language Disabilities 2

Continues ED 3453. Examines selected models of language processes; cognitive and effective dimensions; problems in language pathology; and academic, perceptual-motor, and neurological learning disabilities. *Prereq.* ED 3453.

ED 3455 Teaching Reading in Junior and Senior High School

Considers developmental or corrective reading programs at the secondary level. Examines development of reading rate, comprehension, interpretation, and study skills in the content areas.

ED 3457 Clinical Practicum in Reading

Provides practicum in clinical experience, tutoring children and adults with severe reading disabilities in the Reading Clinic for a total of seventy hours under close staff supervision. Includes a one-hour seminar for discussion and case presentation following each tutoring session. Requires diagnosis, lesson plans, daily logs, complete case history, and final progress evaluation. *Prereq.* ED 3453 and ED 3454.

ED 3458 Field Practicum in Reading

Offers an eighty-hour field practicum that offers students the opportunity to apply consulting and remediation skills in a school setting. Allows students

to consult with teachers on the implementation of developmental and corrective reading and on reading in the content areas and also to provide diagnostic and remediation to pupils having special needs in reading. *Prereq.* ED 3453, ED 3454, and ED 3457.

ED 3460 International Perspectives on Teaching and Learning

Deals with categories of learning experience and modes of acquisition of learning. Emphasizes developmental needs of learners and their relationship, prevailing pedagogical patterns and societal problems in cross-cultural settings. May use African, Asian, European, and Latin-American cultures as contexts for analysis of these issues.

ED 3461 Bilingual Education, Methods, and Materials

Introduces course in the problems, programs, and principles of bilingual/bicultural education. Emphasizes the current methods and materials used in programs nationally and internationally. Studies curricular aspects of bilingual/bicultural programs as well as available research. *Prereq.* Permission of instructor.

ED 3462 Seminar in Ethnicity and Today's School Curriculum

Reviews aspects of the history and culture of some ethnic groups to explore the manner in which certain universal needs are manifested. Evaluates prepared curricular experiences and authentic literary, visual, and artifact materials, and relates to developed criteria, goals, and potential educational impact. Requires students asked to select, organize, and, as necessary, develop materials and strategies appropriate for classroom use.

ED 3463 Urban Education: An Introduction to Teaching in City Schools

Introduces an overview of urban education, especially in the public schools. Studies the demography of city schools as a basis for identifying diverse special education needs of the multicultural population, such as ESL, bilingual education, and ESD. Includes an overview and investigation of current curricular patterns related to this area of education. Includes readings, guest speakers, and first-hand observations of selected schools and programs.

ED 3470 Teaching Adults: Methods and Materials

Helps prepare participants to instruct adults in a variety of academic and nonacademic settings, and emphasizes the skills and knowledge necessary to identify objectives, plan and execute appropriate lesson plans in keeping with students' requirements, develop curricula in a variety of settings, and evaluate students' performance. Includes the presentation of both theory and application through selected case studies that exemplify adult teaching in different environments. Helps acquire the necessary skills for developing individual models of adult teaching behavior to suit various circumstances.

ED 3471 Methods and Materials in Adult Literacy

Introduces students to some current diagnostic and instructional approaches to the functionally and totally illiterate adult. Analyzes and evaluates current methods and materials. May include the development of infor-

mal diagnostic instruments and/or instructional materials for particular adult learners. Offers an overview of national and world literacy problems and programs.

ED 3482 Principles of Programmed Instruction

Studies the development and current status of self-instructional devices. Surveys available programs and teaching machines, including audiovisual machines, with emphasis on the details of the construction and evaluation of programs.

ED 3484 Selection and Utilization of Instructional Material

Deals with all aspects of instructional media, surveying types, techniques, advantages, limitations, sources, and methods of using materials and equipment in specified areas. Emphasizes the selection of appropriate media (print and nonprint) to suit given learning objectives. Provides laboratory experience in operation of equipment and the production of instructional materials.

ED 3486 Developing Multimedia Learning Packages

Allows each student to produce a multimedia (print and nonprint) instructional package for individualized learning.

ED 3500 Leadership in Education, Part 1

Designed to introduce the student to concepts of formal organization. Consists of a two-part sequence and is prerequisite to further study in the Department of Educational Administration. Provides an overview of formal organizations as social systems, with emphasis given to the leadership function. Considers relationships between individuals and organizations. Analyzes communications and decision-making functions.

ED 3501 Leadership in Education, Part 2

Continues an emphasis on the leadership function in organizations and examines selected informal organization elements such as motivation, normative order, social power, conflict, conformity, and creativity. Considers processes of change and innovation in organizations. *Prereq. ED 3500 must be completed before enrollment in ED 3501.*

ED 3502 Instructional Leadership: Curriculum Development and Supervision

Views the responsibilities of administrative personnel relating to the improvement of curricular and instructional practices. Considers evaluative techniques, inservice education, supervisory procedures, and innovative programs. Gives students the opportunity to become engaged in supervisory projects individually or in small teams. *Prereq. ED 3500 and ED 3501, or permission of instructor.*

Certain of the following courses in Educational Administration may be open only to CAGS and doctoral degree candidates or by special permission of the department chairperson, granted prior to registration.

ED 3503 Current Issues in Educational Administration

Examines critical and contemporary issues facing administrators. Analyzes the status of the administrator; federal, state, and local revenue sources; accountability; teacher militancy; equal educational opportunity; controls of schools; and urban education problems. *Required of all CAGS students.*

ED 3504 Human Relations Skills for Administrators

Offers students the opportunity to examine methods of diagnosing problems and responding in management contexts; analyzing the norms, influence patterns, roles, and control systems of organizations; performing some of the critical skills required in the leadership of human organizations; and managing an intervention for the purpose of solving an organizational problem. *Prereq. CRS 3405 or equiv.*

ED 3505 The Process of Administration

Uses case analysis and group activity to gain insight into such areas as the improvement of organizational morale, professional job satisfaction, and current issues of involvement and conflict. Examines alternative courses of action to cope with problematical events confronting educational administrators. *Required of all students pursuing the CAGS.*

ED 3506 Administration of Early Childhood Education

Includes the study of significant elements of administration unique to the planning, implementation, and operation of an early childhood education center. Considers funding sources, intra-institutional relationships, patterns for designing early childhood programs, onsite visitations, modes of private governance, use of plant, student and teacher placement, role of volunteers, and related topics. *Prereq. ED 3500 and ED 3501.*

ED 3507 Administration of the Elementary School

Surveys the operational tasks performed by the elementary school administrator. Includes school-community relations, student personnel, staff personnel, curriculum and instruction, physical facilities, finance and business management, and organizational structure. *Prereq. ED 3500, ED 3501, or permission of instructor.*

ED 3508 Administration of the Secondary School

Surveys operational tasks performed by the secondary school administrator. Includes school-community relations, student personnel, staff personnel, curriculum and instruction, physical facilities, finance and business management, and organizational structure. *Prereq. ED 3500, ED 3501, or permission of instructor.*

ED 3509 Administration of Two-Year Colleges

Examines emergence of the community college movement in the United States, administrative structures and governance, the role of faculty in planning, the student population and related student personnel services. Emphasizes the identification and utilization of community resources in curriculum development and the college's total relationships with the community in which it exists. Emphasizes the two-year technical institute and both publicly and privately supported junior colleges. Includes field visits as an integral part of course requirements.

ED 3510 Academic Administration in Higher Education

Recruitment of properly qualified faculty and staff is only one problem of the academic administrator. This course will also consider the problems of pupil services, admissions, athletics, curriculum development, accreditation, instructional resources, registration and

scheduling, faculty organization, continuing education, faculty rights and responsibilities, and personnel policies.

ED 3511 Administration of Cooperative Education

Examines significant elements in the planning, implementation, and operation of a cooperative education program. Topics include agents for institutional change, intra-institutional relationships, program costs and funding sources, cooperative education calendars, development of cooperative work assignments, relationships with cooperative employers, and operational policies.

ED 3512 Administration of Adult and Continuing Education

Studies the historical development of adult and part-time education, with attention to the present status and trends for the future, with emphasis on the administration of these programs. Includes a variety of adult educational programs in schools, colleges, junior colleges, religious agencies, social service organizations, business and industry, and professional organizations, focusing on planning, implementing, administering, financing, and evaluating such programs.

ED 3513 Problems in Urban School Administration

Examines the problems of educational administration in the complex city school system with emphasis on solutions to educational problems caused by the unique demographic characteristics of the city.

ED 3514 Administration of Experiential Education Program

Focuses on the planning, organizing, budgeting, implementing, and evaluating of experiential education programs, with particular emphasis on work-related programs in a variety of countries. Examines the development and operation of such programs as cooperative education, cooperative work experience, external degree, "sandwich courses," "enseignement en alternance," study service, and other work/school arrangements leading to discussion of the administrative problems involved. Topics include off-campus learning, administrative involvement in assessment, appropriate supervision techniques, and the development of a rationale for work in the curriculum.

ED 3515 The Administrator's Role in Supervision and Evaluation

Examines the leadership role as it relates to supervision and evaluation. Through role playing, case analysis, and the use of videotapes, students have the opportunity to engage in activities typically required of building or unit administrators. Presents a variety of supervisory and evaluation techniques and formats appropriate to both formative and summative evaluations for examination.

ED 3516 Administration and Supervision of Special Education

Designed for advanced graduate students preparing for administrative or supervisory positions in special education programs. Studies facilities and curriculum adjustments, staff roles, methods and content for in-service training, and the use of the team approach. May require field trips to observe and evaluate programs.

ED 3517 Simulated Problems: Elementary School Administration

Places students in a simulated decision-making situation as a principal or administrator of an elementary school. Presents background materials that describe all aspects of a school system, including its publics, its policies, its certified and noncertified staff members, and its geographical and socioeconomic makeup. May disseminate these background data through motion pictures, film strips, and taped interviews with influential people in the community, as well as through written materials. *Prereq.* ED 3500, ED 3501, or permission of instructor.

ED 3518 Simulated Problems: Secondary School Administration

Places students in a simulated decision-making situation as a principal or administrator of a secondary school. Presents background materials that describe all aspects of a school system, including its publics, its policies, its certified and noncertified staff members, and its geographical and socioeconomic makeup. May disseminate these background data through motion pictures, film strips, and taped interviews with influential people in the community, as well as through written materials. *Prereq.* ED 3500, ED 3501, or permission of instructor.

ED 3521 Problems in College Administration: A Simulated Experience

Places students in simulated decision-making situations as administrators of a college or junior college. Presents background materials that describe many aspects of a college, including its policies, the makeup of its faculty and student body, its financial situation, the community it serves, and its board of control. *Prereq.* ED 3528 or permission of instructor.

ED 3522 Simulated Problems: Administration of Occupational and Career Education

Challenges students with a series of simulated decision-making situations such as those which are usually faced by administrators of programs in the area of occupational and career education. Includes readings, audiovisual material, and class interactions.

ED 3523 Seminar in Educational Administration

Serves as a culminating experience for students majoring in school administration at the master's level. Confronts students with major issues facing the school and its administrators. Emphasizes applying knowledge gained in previous administrative courses to an understanding of contemporary education problems. *Prereq.* ED 3500, ED 3501, or permission of instructor.

ED 3524 Seminar in Occupational and Career Education

Confronts students with a sampling of the major issues facing administrators and supervisors of occupational and career education programs in their efforts to organize, promote, and operate such programs. Emphasizes applying the knowledge acquired in previous courses and other program experiences to arrive at an understanding of contemporary occupational and career education problems and their solutions.

ED 3525 Personnel Administration

Considers the purposes, patterns, and issues in personnel administration. Includes the skills, attitudes, and knowledge which an institutional staff needs to have and which are essential to the accomplishments of organizational goals. Focuses on personnel administration programs and problems.

ED 3526 Educational Finance

Deals with the principles and problems of financing education, and also considers the basic concepts of economics relative to the place of school finance in the field of public finance. Examines the sources and rationale for public support of schools. Includes selected state and federal aid programs, capital outlay programs, current practices and issues of local support, and bond issue campaigns.

ED 3527 School Business Management

Considers practices and issues in the administration of school business affairs. Examines the role of the school business administrator and the educational budget. Stresses principles of budget preparation and development, purchasing, supply management and distribution, school accounting and data-processing systems, auditing, financial reporting and management of payroll, transportation programs, and school food services, and the operation and maintenance programs for the physical plants. Places each student in a simulated decision-making situation. Presents background materials that have been prepared describing aspects of a fictitious school system, including its publics, policies, and other relevant information. May give each student the opportunity to deal with matters typically faced by the school business administrator.

ED 3528 Financial Management in Higher Education

Seeks to combine a knowledge of fund-raising activities with the study of proper financial management in higher educational institutions. Considers the problems of fund raising for both public and private, two- and four-year institutions. Presents modern techniques of budget preparation and control may include purchasing, school accounting, data processing, providing benefits for faculty, financial reporting, food services, housing, and operation and maintenance of the physical plant.

ED 3529 School Plant Planning, Operation, and Maintenance

Seeks to have the student develop a basic understanding of the processes involved in the planning, maintenance, and operation of school plants. Involves such items as educational specifications, the process of school construction, techniques for providing clean, safe, and healthy environments for the teaching-learning process, along with the selection, assignment, and supervision of custodial and maintenance staff. Reviews statutes or regulations pertaining to these processes used by state and local regulatory bodies. Considers issues related to declining enrollments and school closings.

ED 3530 Institutional Planning and Facilities

Considers the planning of new colleges as well as the expansion and maintenance of existing ones. Studies

systems analysis, needs surveys, and development of educational specifications for college facilities as half of the course. Involves studying the operation and maintenance of the physical plant, including provisions for housing, safety, parking, communications, and health service as the other half.

ED 3531 Systems Theory in Education

Provides the student with an introduction to general systems concepts and terminology as well as the implications of systems theory to leadership and administration. Topics include systems applications such as input/output analysis, PERT, feedback monitoring and response, flowchart logic, and the computer as a system. Considers systems study as a method of planning and evaluation. *Required of all students pursuing the CAGS.*

ED 3532 Organizational Analysis

Examines different approaches used to define traits or characteristics of formal organization. Emphasizes the application of models, typologies, and schemes to identify structural or procedural deficiencies in bureaucratic social systems. *Prereq. Permission of instructor. Open only to advanced graduate students.*

ED 3534 School-Community Relations

Includes the study and design of school-community relations programs based on the principles and practices of the intercommunications between the school and its several publics. Reviews selected research findings relative to public relations programs in business, industry, and governmental agencies in addition to those involving educational systems. Stresses the role of the administrator in the development of a comprehensive program of school community relations to the administrative unit.

ED 3535 School Law

Develops a basic understanding of federal and state laws that apply to school systems, educational programs, and personnel, as well as of the legal prerogatives available to the practicing administrator and the local boards of education. Considers the constitutional, statutory, and common-law foundations of educational systems and the school administrator's role with respect to them.

ED 3536 Collective Negotiations in Education

Provides prospective administrators and those already engaged in administration with knowledge of the collective negotiation process and collective negotiation strategies and tactics. Uses a systems approach to collective negotiations, including simulation exercises and cases. Invites guest lecturers experienced in collective negotiations in the seminar, if possible.

ED 3537 Program Planning and Workshop Design

Administrators who wish to be effective must know the techniques for directing client-needs assessment. This course presents a variety of strategies designed to help students develop skill at assessing client needs, followed by discussions regarding ways in which these needs are translated into program/workshop objectives. The administrator's role in program and workshop design, with emphasis on managing the learn-

ing activities, is demonstrated through student involvement in administrative activities. Attention is devoted to the variety of settings in which adult-education administrators work, including educational institutions, business and industry, governmental agencies, and human-service organizations.

ED 3538 Securing and Administering Grants in Education

Provides school administrators with knowledge of fund-raising for educational purposes and supervisory techniques for funded programs. Uses a systems approach to grantsmanship, emphasizing the methods and techniques of fund raising, program planning, and proposal writing.

ED 3540 Typologies of Higher Education

Studies the types of higher educational institutions, with emphasis on organizational structure, modes of governance, and administration. Considers the history of higher education, particularly the development of colleges, universities, and junior colleges in the United States, to provide perspective for the modern college administrator. Focuses on important issues and the problems they present for administrators.

ED 3541 Innovation and Change

Emphasizes administrative strategies in effecting structural alterations, curricular organization, and instructional techniques, which vary the particular problems relevant to the issues that receive consideration. *Required of all students pursuing the CAGS.*

ED 3542 Politics and Educational Decision-Making

Examines federal, state, and local governmental arrangements and political processes that influence educational policies of school systems. Emphasizes the application of political science concepts and research methods to educational policy-making processes and to the political environment surrounding the educational administrator.

ED 3543 Directed Field Experiences in the Administration of the Elementary School

Coordinates study and discussion of administrative functions with selected field trips to administrative settings and with guest lectures by practicing elementary school administrators. Visits such settings as an elementary school, a middle school, a superintendent's office, a school committee meeting, and appropriate federal and state agencies. Requires each student to participate in an administrative field experience in an elementary setting for a minimum of four hours per week. *Prereq. ED 3500 or permission of instructor. Required of all master's candidates who major in school administration.*

ED 3544 Directed Field Experiences in the Administration of the Secondary School

Serves as a companion course to ED 3543, required of all master's candidates in school administration. Coordinates study and discussion of administrative functions with selected field trips to administrative settings and with guest lectures by practicing secondary school administrators. Aimed at educational agencies at the secondary level and may include visits to a comprehensive high school, a junior high school, a regional voca-

tional-technical school, a superintendent's office, a school committee meeting, and appropriate federal and state agencies. Requires each student to participate in an administrative field experience in a secondary school for a minimum of four hours each week. *Prereq. ED 3500 or permission of instructor. ED 3544 may be a continuation of ED 3543 or may precede it.*

ED 3545 Practicum Administration

Serves as an individualized offering involving supervised observations, internships, externships, and seminars in educational administration. Designed to provide further practical experience in the student's area of administrative preparation. Must be worked out with the adviser not later than the end of the second week of the quarter preceding the quarter during which the internship will take place.

ED 3546 Practicum in Special Education Administration

Serves as an individualized offering for students preparing for administrative roles in areas of special education. Offers experiences in supervised observations, internships, externships, and seminars in special education administration. Must be worked out with the student's adviser not later than the end of the second week of the quarter preceding that in which the internship is to take place.

ED 3800 Directed Study

Provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. Not available to special students. *Prereq. Approval of the chair of the department and of the director of the graduate school. Approval forms must be submitted during the quarter prior to registration for the directed study.*

ED 3801 Thesis

8 QH

Offers a research activity that may be selected by the student in lieu of two courses (8 QH), with the approval and recommendation of the adviser.

ED 3806, ED 3807, ED 3808 Doctoral Seminar in Leadership, Administration, and Supervision 1, 2, 3

Uses the dialogues in these courses as an interdisciplinary approach to explore complex behavioral and structural interactions found in formal organizations. Emphasizes integrating theoretical concerns with practical administrative functioning.

This sequence of seminars is viewed primarily as a pooling of the results of extensive individual student research and activities and is aimed at giving the student an overview of all aspects of the institution he or she will be leading. *These seminars open only to students who have been accepted to a doctoral program. Required of all students pursuing the EdD degree.*

ED 3809 Doctoral Dissertation

Prereq. Admission to candidacy in the Doctor of Education Degree Program.

ED 3820 Workshop in Foundations of Education

(See general workshop description on page 74.)

ED 3821 Workshop in Elementary Education

(See general workshop description on page 74.)

- ED 3822 Workshop in Secondary Education**
(See general workshop description on page 74.)
- ED 3823 Workshop in Administration**
(See general workshop description on page 74.)
- ED 3825 Institute in Elementary Education**
(See general institute description on page 74.)
- ED 3826 Institute in Secondary Education**
(See general institute description on page 74.)

- ED 3827 Institute in Educational Administration**
(See general institute description page 74.)
- ED 3828 Institute in Foundations of Education**
(See general institute description page 74.)

Health, Sport, and Leisure Studies

HSL 3410 Contemporary Theories of Recreation and Sport
Considers historical and philosophical perspectives of recreation, sport, and leisure. Emphasizes change over time and its implications for the leisure industry.

HSL 3412 Seminar in Contemporary Issues and Problems in Recreation, Sport, and Fitness
Discusses national and international issues, current trends, and contemporary problems as they affect recreation services.

HSL 3421 Budget Analysis
Explores capital and operating budgets using such techniques as cost-effectiveness and benefit-cost analysis, forecasting, and present value analysis. Studies the concepts of depreciation, direct and indirect costs, and service volume as they relate to pricing decisions. Focuses on improving management decisions.

HSL 3425 Public Relations and Marketing for Recreation, Sport, and Fitness
The central purpose of public relations is to influence public opinion. This course focuses on the practical aspects of public relations for recreation, sport, and fitness enterprises. Emphasis is on linkages among public relations, marketing, and personnel management.

HSL 3506 Nutrition
Studies nutrition principles, behavior, and counseling, as well as clinical applications of nutrition as it relates to health, exercise, sport, and cardiac rehabilitation. *Prereq.* Exercise physiology, nutrition, or permission of instructor.

HSL 3615 Anatomic Kinesiology
Examines the human musculoskeletal system with respect to the internal and external forces acting upon the human body. Applies principles of statics and dynamics in normal and atypical motion. *Prereq.* Kinesiology or permission of instructor.

HSL 3616 Mechanical Analysis of Human Motion
Applies mechanics of motion to human motion. Provides an overview of the methodology of human motion analysis. Emphasizes the use of film and video in teaching, coaching, clinic, and human motion research. *Prereq.* HSL 3615.

HSL 3617 Physical Fitness Appraisal and Guidance
Considers principles and procedures used to administer lab and field tests of cardiovascular endurance, body composition, joint flexibility and muscular strength, power, and endurance. Explores principles and procedures used to develop conditioning programs to improve these parameters. Focuses on the low-risk individual in nonclinical settings. *Prereq.* Exercise physiology or permission of instructor.

HSL 3618 Exercise in Health and Disease
Studies role of exercise in health and disease including acute and chronic effects of exercise upon the cardiovascular, respiratory, metabolic, and muscular systems of individuals with cardiovascular, pulmonary, or metabolic diseases. Surveys principles of human performance assessment, exercise prescription and programming applied to adults in exercise-based prevention, intervention, and rehabilitation programs. *Prereq.* Exercise physiology.

HSL 3619 Electrocardiography
Studies basic and intermediate electrocardiography, including cardiac function, lead systems, rate, rhythm, axis, infarction, ischemia, hypertrophy, effects of cardiovascular drugs, and purposes and principles of exercise testing. *Prereq.* HSL 3618.

HSL 3620 Laboratory in Exercise Testing and Prescription
Offers a practicum in clinical graded exercise testing including determination of EKG, blood pressure, pulmonary, and metabolic response to exercise, and prescription of exercise for at-risk to high-risk persons in cardiopulmonary prevention, intervention, and rehabilitation programs. Requires students to do clinical fieldwork as exercise test technicians in prevention and/or rehabilitation programs and to conduct a project. *Prereq.* HSL 3618 and HSL 3619. (HSL 3619 may be taken concurrently.)

HSL 3621 Advanced Cardiopulmonary Physiology
Surveys the current knowledge of cardiovascular function relating the physiology of the circulatory system in its normal, diseased, and stressed states. Emphasizes the interaction between the components of the cardiovascular and respiratory systems. Current research topics will be covered. *Prereq.* HSL 3618.

HSL 3622 Cardiovascular Pharmacodynamics in Clinical Exercise Physiology

Studies the current medications used in the treatment of congestive heart failure, coronary artery disease, arrhythmias, angina, and hypertension; the effects of these medications during acute and chronic exercise; and cardiac emergency medications. *Prereq.* HSL 3619 and HSL 3623.

HSL 3623 Cardiopulmonary Pathophysiology

Offers lecture and laboratory study of anatomy, physiology, and pathophysiology for the cardiac and pulmonary systems as applied to the dysfunction and rehabilitation of the cardiopulmonary patient. *Prereq.* HSL 3618.

HSL 3624 Applied Biomechanics for the Exercise Specialist

Applies anatomical and biomechanical principles to exercise technique, exercise-induced injuries, and exercise equipment. Designed specifically for students in the clinical exercise physiology program, and is not open to students in other concentrations. *Prereq.* Undergraduate course in anatomy.

HSL 3627 Health Promotion Program Planning

Examines health promotion programs in a variety of settings including program components, assessment, design, implementation, and evaluation. Discusses case studies from health-related programs to assist students in developing wellness and health promotion philosophy and strategies. *Prereq.* HSL 3618 or permission of instructor.

HSL 3642 Sociology of Sport

Analyzes the sociological principles and factors operative in the interaction between sport and society. Reviews pertinent literature and research. Topics include the pervasiveness of sport, social stratification, politics, economics, sport and the mass media, race, women, violence, competition, deviance, subcultures, and sport in the future. *Prereq.* General sociology or permission of instructor.

HSL 3651 Supervision of Professional Personnel

Studies ways of effectively matching the needs of individuals with those of the organization. Emphasizes leadership, conflict resolution, and evaluation from an organizational development perspective.

HSL 3652 Critical Thinking and Evaluation

Investigates the acquisition of knowledge in two disciplines. Includes evaluating knowledge and practice through experiences in decision-making, logical analysis, and critical thinking.

HSL 3653 Legal Issues in Recreation, Sport, and Fitness 3 QH

Analyzes recreation and sport from legal, social, and economic standpoints. Emphasizes the impact of law and legal principles on recreation and sport.

HSL 3654 Club and Sport Enterprise 3 QH

Provides an overview of the club and resort industries with emphasis on internal and external sources of industry information and practical uses of such information. Studies external factors that influence industry trends. This is an introductory course.

HSL 3655 Facilities and Operations Management 3 QH

Studies the day-to-day work required of operating managers in selected recreation, sport, and fitness settings. Emphasizes how technology and human relations can best be used to carry out the operations of an organization. *Prereq.* HSL 3654.

HSL 3656 Strategic Planning for Clubs and Resorts 3 QH

Analyzes internal and external factors that impact on long-term operations of clubs and resorts. Studies the development and implementation of competitive strategy. Integrates information from the following prerequisites: the club and resort enterprise, club facilities and operations, research design, financial analysis, marketing, and organizational behavior.

HSL 3657 Managing the Professional Sports Franchise 3 QH

Discusses and analyzes major issues facing managers of a professional sports franchise. Focuses on topics such as corporate structure, finance, player negotiations, contracts, press relations, and auxiliary enterprises.

HSL 3822, HSL 3823 Seminar/Workshop

Presents special seminars or workshops in recreation and leisure studies on topics of timely interest. Provides for graduate credit to be granted for successful completion of a workshop, but credit may not be applied toward a degree program without the program adviser's approval. Includes a maximum of eight quarter hours earned in seminars or workshops that may be applied toward the degree.

HSL 3824 Master's Project/Internship 6 QH

Will be designed in close consultation with faculty and industry sponsor. Intends to develop greater breadth or depth of understanding of important management issues in a specific segment of the recreation, sport, and fitness industry. Provides for projects to be submitted to a faculty committee for evaluation. Concludes as students present orally the findings related to their projects and defend conclusions against questions raised by the faculty review committee.

HSL 3830 Internship in Clinical Exercise Physiology 1

Offers a supervised part-time internship in a preventive/rehabilitative health and exercise program providing care to individuals with cardiovascular, pulmonary, or metabolic disease, or in an applied exercise physiology laboratory. Includes clinical exercise testing, exercise prescription, and/or exercise leadership. Requires students to complete a minimum of 120 hours during a six- to twelve-week period. Requires a proposal for a review of literature and three case studies related to the internship site to be approved by the student's faculty supervisor.

HSL 3831 Internship in Clinical Exercise Physiology 2

Continues the supervised internship in another role in a preventive/rehabilitative health and exercise program or in an applied exercise physiology laboratory. Requires students to complete a minimum 120 hours during a six- to twelve-week period of clinical experience. Requires a review of literature and three case studies to be completed and approved by the faculty supervisor.

HSL 3894 Independent Study

Under the guidance and direction of a program adviser, gives students the opportunity to develop and conduct projects related to their professional interests. *Prereq.* *Written proposal and permission of program adviser.*

HSL 3898, HSL 3899 Seminar/Workshop

Offers special seminars or workshops on topics of timely interest. May provide for graduate credit to be granted for successful completion of a workshop, but credit may not be applied toward a degree program without the program adviser's approval. Allows a maximum of eight quarter hours earned in seminars or workshops to be applied toward the degree.

Physical Therapy

PTH 3505 Cardiopulmonary Diagnostic Techniques

Provides an overview of the various noninvasive and invasive techniques for diagnostic purposes, including examination of these techniques as guidelines useful in determining the extent of cardiopulmonary damage, work capacity, and residual function. Studies techniques including electrocardiography, systolic time intervals, pulmonary function, laboratory test findings, and gas analysis. *Prereq.* *PTH 3560, HSL 3618, or permission of instructor.*

**PTH 3510 Cardiac Rehabilitation Programs 2 QH
Phases 1, 2**

Surveys various cardiac rehabilitation programs, their objectives, relevant medical considerations, indications, and contraindications. Topics include referrals, organizational structure, proposal writing, liabilities, and insurance plans available for these two phases of rehabilitation. *Prereq.* *PTH 3560 or permission of instructor.*

PTH 3515 Pulmonary Rehabilitation Programs 2 QH

Explores theory and practice of pulmonary therapy. Utilizes treatment procedures with medical and surgical respiratory patients. *Prereq.* *PTH 3560 or permission of instructor.*

PTH 3527 Medical and Surgical Conditions of Cardiac and Pulmonary Patients

Examines current medical and surgical treatment of cardiac and pulmonary anomalies and dysfunction. Investigates the acute and chronic disorders that cause these dysfunctions, as well as their etiologies, symptomatology, and treatment. Identifies the techniques of various surgical procedures, as well as the preoperative, intraoperative, and postoperative management of the patient. Investigates the role of the physical therapist. *Prereq.* *Minimum of one year in cardiopulmonary therapy, PTH 3560, or permission of instructor.*

PTH 3530 Basic Applied Neuroanatomy

Studies the human nervous system from a functional perspective, including analysis of components of the nervous system as they relate to common clinical problems. Emphasizes the therapist's role in recognizing

and treating these problems. *Prereq.* *Gross Human Anatomy or permission of instructor.*

PTH 3535 Advanced Functional Neuroanatomy

Studies anatomy of the nervous system from a functional perspective. Focuses on the role of the cortex, basal ganglia, thalamus, and cerebellum in regulation of tone control, sensation, and posture. Uses current and classic literature. *Prereq.* *PTH 3530.*

PTH 3540 Advanced Topics in Neurodevelopment

Examines and interprets both classic and current nonhuman and human research studies. Presented in seminar format. *Prereq.* *One year of clinical experience in neurology, PTH 3560, or permission of instructor.*

PTH 3545 Neuromuscular Physiology

Considers classic concepts of normal muscle and nerve structure and function. Emphasizes clinical impacts of disease and injury on neuromuscular morphology and physiology where appropriate. Gives the student the opportunity to become familiar with current theory that may be relevant to evaluation and management courses offered in the program.

PTH 3550 Evaluation of the Neurologically Impaired Adult

Provides a framework for analyzing motor dysfunction, based on the fundamental properties underlying movement disorders, which is then used to critique current evaluations of neurologic disabilities and to develop a rationale for a logical and comprehensive evaluation of the neurologically impaired adult. *Prereq.* *PTH 3560, equiv. or permission of instructor.*

PTH 3555 Treatment of the Neurologically Impaired Adult

Discusses treatment of the neurologically impaired adult from a historical perspective and from current neurological and neurophysiologic knowledge. Critiques current techniques from a clinical and theoretical point of view. Topics include specific treatment techniques as well as specific neurologic disabilities. *Prereq.* *One year clinical experience in physical therapy with background in treatment of neurologic patient and PTH 3550.*

PTH 3560 Practicum in Physical Therapy 1

Offers practicum in supervised clinical practice within the specified specialty area. Expects students to com-

plete 240 hours of clinical experience in a healthcare setting. *Required as a prerequisite in selected courses for those students who do not have a minimum of one year of clinical experience at the time of registration for these courses.*

PTH 3576 Evaluation and Treatment of the Neurologically Impaired Child

Reviews and analyzes clinical tests and measurement strategies utilized by clinical specialists in neurologic/pediatric physical therapy is done with an emphasis on the use of standardized tests to include data interpretation. Focuses on the use of the problem-solving

approach to client care, incorporating the collection and analysis of data with the selection of specific treatment strategies in the development of a treatment plan. Analyzes and reviews the selection of treatment strategies with an emphasis on the investigation of the rationale and efficacy of the same.

PTH 3800 Independent Study

Under the guidance and direction of a program adviser, gives students the opportunity to develop and conduct projects related to their professional interests. *Prereq. Written proposal and permission of program adviser.*

Speech-Language Pathology and Audiology

SLA 3300 Introduction to Speech and Hearing

Offers an overview of speech and hearing disorders and treatment, and a review of normal speech and hearing development. Requires clinical observations of persons with speech, language, and hearing disorders.

SLA 3301 Hearing Science

Presents concepts related to the physics of sound, followed by an in-depth study of the anatomy and physiology of the normal hearing mechanism. Also discusses principles of psychophysics of audition.

SLA 3302 Anatomy and Physiology of Vocal Mechanisms

Offers an in-depth study of the static structure, musculature, and physiology of the speech mechanism. Emphasizes current research in speech physiology.

SLA 3303 Introduction to Audiology

Focuses on the techniques of audiometric testing and hearing conservation, including a review of hearing sciences and a prepracticum and lab experience in hearing testing.

SLA 3304 Speech Science

Examines the basic sciences involved in speech and audition, including in-depth study of the analysis of sound and the acoustic composition of speech. Emphasizes a review of current theory and research in speech reception, perception, and production. *Prereq. SLA 3300 and SLA 3301.*

SLA 3305 Fluency Disorders

Offers a comprehensive study of the various theories and symptomatology of stuttering from the earliest historical references through the nineteenth and twentieth centuries. Requires clinical observations.

SLA 3306 Developmental Semantics and Syntax

Analyzes the emerging semantic and syntactical aspects of language in normal and atypical children. Discusses current theory and research in language acquisition. Requires clinical observations of children with normal and atypical language patterns.

SLA 3307 Phonetics and Developmental Phonology

Offers basic training in auditory recognition and symbolization of phonemes and allophones in major North American dialects. Stresses static and dynamic articulatory descriptions. Also includes a review of the developmental sequence of phonemic acquisition.

SLA 3308 Phonemic Disorders

Provides a practical and theoretical examination of phonemic disorders and etiology; also examines diagnostic tools for evaluation and methods of treatment. Requires clinical observations of persons with phonemic disorders.

SLA 3600 Neurological Bases of Communication

Provides the student the opportunity to acquire a basic understanding of neuroanatomy and neurophysiology as they relate to normal aspects of speech, hearing, and language.

SLA 3601 Advanced Study in Articulation Disorders

Explores advanced theories of normal and abnormal phonological development with emphasis on distinctive theory and on phonetic theories of speech production; direct application of theories to diagnosis and treatment of various phonological disorders. *Prereq. Undergraduate course in articulation disorders and permission of instructor.*

SLA 3604 Language Disturbances in Children

Emphasizes current theories in language behavior and their practical application to the assessment and remediation of language disturbances in children. Uses lectures, discussions, and case presentations to focus on the following issues: what constitutes a language problem, what assessment tools and therapeutic techniques are currently available, and what underlying principles are involved in selecting and organizing the content of a remediation program. *Prereq. Permission of instructor.*

SLA 3605 Aphasia Rehabilitation

Provides training in the diagnosis and remediation of adult neurologically based communication disorders. Reviews clinical methods of diagnosis and demonstrates their application to therapeutic decision-making. *Prereq. SLA 3600 and permission of instructor.*

SLA 3606 Clinical Management in Stuttering

Emphasizes diagnostic techniques, a review of the current therapeutic approaches, consideration of the individual's need in therapy, and the process of behavioral and attitudinal change from within a psychodynamic framework. Considers termination, referral, and group therapy. *Prereq. Permission of instructor.*

SLA 3607 Seminar in Speech Science

Focuses on current physiological, acoustical, and perceptual data used to describe both normal and disordered speaking populations. Examines research techniques and instrumentation in the field of speech science. Discusses the application of theoretical information from speech science to the diagnosis and treatment of communicative disorders. *Prereq.* SLA 3875 and SLA 3876

SLA 3608 Seminar in Voice Disorders

Considers etiology, symptomatology, and disorder complexes related to phonation. Emphasizes the philosophy and methods used in the assessment and treatment of voice disorders. *Prereq.* SLA 3302 and SLA 3655.

SLA 3610 Audiology for Speech-Language Pathologists

Provides speech-language pathology majors a review of standard procedures and an update of contemporary issues in audiology. Focuses on pathological disruption of the auditory system and on assessment procedures currently applied and their relationship to patient management and treatment plans.

SLA 3620 Diagnostic Audiometry

Presents an in-depth examination of the various uses of pure tone, speech, and impedance measures as they relate to the standard audiological assessment. Covers case history and case reporting. *Prereq.* *Introduction to audiology or permission of instructor.*

SLA 3623 Differential Diagnosis in Audiometry

Examines in detail the site of lesion test battery approach to differential diagnosis in audiology. Topics include Bekesy, ENG, SISI, tone decay tests, ABLB, acoustic reflex, and auditory evoked potentials (ABR). *Prereq.* SLA 3620 or permission of instructor.

SLA 3624 Amplification

Explores physical characteristics of hearing aids and their performance. Offers theoretical approach to selection and fitting of hearing aids, and analysis of hearing aid dispensing systems. *Prereq.* *Introduction to audiology and permission of instructor.*

SLA 3625 Psychosocial Aspects of Communication Disorders

Covers the psychological, educational, and social aspects of communication disorders, particularly auditory impairment. *Prereq.* *Permission of instructor.*

SLA 3626 Seminar in Audiology

Offers advanced study of the development of principles and theories associated with modern procedures and methods used in audiology. *Prereq.* *Permission of instructor.*

SLA 3628 Psychoacoustics

Explores the relationship between acoustic stimuli and psychological responses to sounds. Stresses the similarities and differences in the perception of normal hearing and among different types of impaired hearing. Topics include a general review of the physics of sound, detection, discrimination, masking, binaural hearing, and speech perception. *Prereq.* *Permission of instructor.*

SLA 3629 Aural Rehabilitation

Examines various approaches to speechreading and auditory training in detail as they apply to children and adults. Provides an integrated approach to management of hearing-impaired individuals. *Prereq.* *Introduction to audiology.*

SLA 3630 Auditory Pathology

Provides an overview of temporal bone and eighth nerve anatomy. Discusses physiology of the auditory system. Covers the more frequently encountered pathologies affecting the auditory system as well as medical/surgical treatment of those disorders.

SLA 3631 Rehabilitative Audiology

Required of all audiology majors. Provides information about the effects of hearing loss on communication, the role of the audiologist in the rehabilitation process, approaches to counseling, uses of amplification, and issues in industrial and educational hearing conservation.

SLA 3632 Professional Practice

Provides contemporary information relative to the practice of audiology. Topics include planning a business practice, establishing a successful business operation, securing third-party reimbursement, and providing services within state licensing and ASHA ethical guidelines.

SLA 3640 Cerebral Palsy

Studies neuromuscular involvements and concomitant language and speech disorders; intellectual deficits, psychological aspects, communicative disorders of a cerebral palsied population; and testing, placement, and management of the cerebral palsied child with emphasis on a multidisciplinary approach. *Prereq.* *Permission of instructor.*

SLA 3641 Physiological Acoustics

Emphasizes the biophysics of the hearing mechanism, especially in terms of actual clinical utility. Stresses comparative anatomy and physiological analysis. *Prereq.* *Introductory courses in speech and hearing, and permission of instructor.*

SLA 3642 Seminar in Orofacial Anomalies

Considers etiology, symptomatology, and problems associated with orofacial anomalies. Emphasizes the speech, language, and hearing characteristics and the assessment and treatment of persons with orofacial anomalies. Presents psychological and social considerations and analysis of the team rehabilitative effort.

SLA 3643 Seminar in Speech Pathology

Offers individual research and/or critical review of the literature in some area of basic science, speech sound learning, language, voice, fluency, or multiple disorders, with special emphasis on the impact of deafness on psychosocial development. May include class presentation of material and class discussion. *Prereq.* *Open to graduate students who have completed the equivalent of two quarters of graduate work in speech pathology and have the instructor's permission.*

SLA 3645 Neuropathology

Applies functional neuroanatomy in comprehending the various disease processes involving the nervous system: cerebrovascular disease tumors or malformations, Parkinson's disease, multiple sclerosis, and others. *Prereq. Permission of instructor.*

SLA 3647 Seminar in Hearing Science

Offers individual research and/or critical review of the literature in the area of bone conduction of auditory signals, evoked response and audiometry, impedance and audiometry, cortical processing of auditory input, and other related topics. Requires students to be responsible for class presentations of researched material. *Prereq. Permission of instructor.*

SLA 3650 Medical Perspective to Anatomical Correlates in Speech Pathology

Provides hands-on experience with dissection of human larynxes as an approach to learning voice tract anatomy. May familiarize students with dissection techniques and use of dissecting microscope, and may give them an opportunity to observe actual surgical procedures in a hospital. *Prereq. Permission of department chair.*

SLA 3651 Social Dialectology: Theoretical and Educational

Focuses on the social and cultural influences on the language behavior and communication needs of the culturally "different" child. Emphasizes the interrelationship between linguistic structure and social structure and its implications for clinical intervention. *Prereq. Permission of instructor.*

SLA 3652 Behavior Modification: Operant Procedures in Speech and Language Training

Reviews principles and procedures of the functional analysis of behavior and focuses upon the application of behavioral theory and research to speech, language, and hearing training. Emphasizes clinical investigation in the experimental analysis of behavior of communications disorders and experiences in the application of experimental procedures in assessment and treatment programs. *Prereq. Permission of instructor.*

SLA 3653 Seminar in Communication Disorders

Provides an exploration into the development of communication and communication disorders, with focus on early conversational interaction, children's discourse, and pragmatic intents. Emphasizes deficient social bases and their effect on language performance as well as trends for clinical procedures and intervention strategies for language-disordered children. Views communication as the ultimate goal of therapy. Requires course participants to complete a research project on the development of communication and child discourse and its application to clinical assessment and intervention.

SLA 3654 Augmentative Communication

Provides a theoretical understanding of the principles involved in the prescription of hardware and software to the non-speaking, hands-on training in the use of computer software, and on-site clinical training in the use of that software. *Prereq. Graduate student status and understanding of principles of learning theory or therapy process or permission of instructor.*

SLA 3655 Differential Assessment

Explores and explains the relationship between different models of speech and language processing and their implications for diagnostic procedures and test selection. Focuses on analysis of case history information, interpretation of diagnostic results, understanding normative data, evaluation of test reliability and validity, and demonstration of various test instruments.

SLA 3690 Seminar in Normal Language Acquisition

Assesses current theories and designs of studies of language acquisition and processing from infancy through adolescence. Discusses special problems in data collection and analysis in the various areas of child language through lectures, student presentations, and discussions of current research. Critiques methodology, data, and results of current research and their significance to theories of language acquisition using video-taped and audio-taped data samples. Requires each student to write a research proposal to investigate a specific topic in language acquisition.

SLA 3691 Sociolinguistics

Consists of basic sociolinguistic concepts including dialectal variation and other forms of language variation, attitudes toward language use and the speech community; language needs of multicultural children in educational settings, considering cultural attitudes of teachers and types of learning situations available; and social and cultural diversity and its effects on the individual's communicative competence. Includes methods of sociolinguistic research that will lead to the student designing a language study for application in: discourse analysis; language in the classroom; sociolinguistic effects on reading, writing, oral language, and role relationships.

SLA 3698 Workshop in Speech Pathology and Audiology

(See general workshop description on page 74.)

SLA 3699 Institute in Speech Pathology and Audiology

(See general institute description on page 74.)

SLA 3800 Directed Study

Provides for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. Not available to special students. *Prereq. Approval of the chairperson of the department and of the director of the graduate school. Approval forms must be submitted during the quarter prior to registration of the directed study.*

SLA 3801 Thesis

Offers a research activity that may be selected by the student in lieu of two courses (8 QH), with the approval and recommendation of the adviser.

SLA 3875 Advanced Clinical Practice 1

2 QH

Offers a two-quarter sequence of supervised clinical experience in speech pathology and audiology designed for beginning graduate students. Includes practicum sites at the Northeastern University Hearing, Language, and Speech Clinic; satellite clinics; and/or educational settings. Requires students to be available a minimum of two days per week during the academic year. Requires attendance at on-campus seminar

meetings held weekly. *Prereq.* Departmental permission and GPA of 3.0.

SLA 3876 Advanced Clinical Practice 2 3 QH

Offers a two-quarter sequence of supervised clinical practicum in speech pathology and audiology at the Northeastern University Hearing. Considers language and speech clinic; medical settings; educational settings; and rehabilitation centers. Uses practicum experience to emphasize advanced diagnostic and management techniques stressing the application of theory to practice. Requires students to be available a minimum of two days per week during the academic year. *Prereq.* Departmental permission and GPA of 3.0.

SLA 3877 Advanced Clinical Practice 3 3 QH

Offers a two-quarter sequence of supervised clinical practicum in speech pathology and audiology designed for advanced graduate students. Uses practicum experience to emphasize problem-solving techniques relevant to case management. Requires students to be available a minimum of two days per week during the academic year. *Prereq.* Departmental permission and GPA of 3.0.

Interdepartmental Courses

INT 3500 Research Design and Methodology

Considers research methods and designs used in a variety of professional settings. Emphasizes the development of research techniques, including the ability to define research problems; write hypotheses; review and interpret literature; apply research designs; organize, analyze, and present data; and draw relevant conclusions. *Prereq.* Satisfactory completion of the proficiency examination in statistics or satisfactory completion of any graduate-level statistics course offered by Boston-Bouvé College of Human Development Professions.

INT 3501 Thesis/Project 1

Provides the initiation of a scholarly investigation. Requires students to submit a written research proposal for approval by a thesis/project committee and to present an oral proposal at a college seminar. *Prereq.* ED 3340, INT 3500, completion of two courses in area of concentration, and permission of program adviser.

INT 3502 Thesis/Project 2

Continues INT 3501 implemented with, and culminating in, an approved written report in thesis form. *Prereq.* INT 3501.

INT 3503, INT 3504 Seminar/Workshop

Offers special seminars or workshops on interdepartmental topics of timely interest. Graduate credit may be granted for successful completion of a workshop, but credit may not be applied toward a degree program without the program adviser's approval. A maximum of eight quarter hours earned in seminars or workshops may be applied toward the degree.

INT 3540 Computer Applications for Nonprofit Organizations 3 QH

Presents ways in which generic software packages (database management, spreadsheets, business graphics, and word processing) may be used to improve efficiency and the effectiveness of individuals and organizations. Discusses hardware and software configurations.

INT 3549 Introduction to Computer Programming: FORTRAN

Presents a lab course designed to develop facility in the use of a wide range of data-processing equipment in educational research. Introduces the basic principles of

computer programming, but emphasis will be placed on the applicability and use of existing statistical programs.

INT 3550 Instruction in LOGO

Emphasizes philosophy and programming in the LOGO language. Demonstrates curriculum materials showing the use of the LOGO language in areas such as computer programming, mathematics, and language arts. Presents current research and applications of LOGO in the school curriculum. Requires creation of individual LOGO projects in lab settings.

INT 3551 Instructional Programming in Pascal

Introduces computers and computer programming using the language Pascal. Discusses tools such as text editors. Makes instructional applications where possible.

INT 3552 Computer Use for Educators 2 QH

Designed for educators with minimal computer experience and provides an introduction to word processing, data processing, and file management. Discusses functions of the operating system and the physical hardware. Introduces the BASIC programming language. Gives students extensive hands-on experience in class and through accompanying supervised labs.

INT 3553 Word Processing for Educators 2 QH

Teaches a variety of word processing software programs. Considers applications of word processing ranging from simple one-page letters to documents and mail-merge. Gives students extensive hands-on experience with computers in class and through accompanying supervised laboratories.

INT 3554 Computers in Education

Focuses on the use of computers both as a teaching methodology and as an administrative tool in education. Introduces the use of Computer Assisted Instruction (CAI) through the BASIC programming language. Tests a variety of microcomputer software packages suitable for classroom and administrative use in a laboratory setting. Requires extensive hands-on experience with a number of commercially available educational software packages. Highlights strategies and methods for integrating computing within the elementary and secondary curriculum.

INT 3555 Introduction to Computer Use for Professionals

Includes introduction to computer capabilities and limitations; selection of hardware/software; use of a line editor; introduction to system command language; and introduction to data processing through a packaged library program such as SPSS, BDMP, MINITAB, or IMSL.

INT 3556 Educational Applications of Database Management Systems

Uses several general purpose software packages (database, spreadsheet, and data analysis) and simulations for working through such problems as scheduling/facilities usage, recordkeeping and general ledger/accounting, and survey/market research.

INT 3557 Instruction in LOGO 2

Represents a second course in the LOGO environment, emphasizing advanced concepts in LOGO, including the use of list-processing in language, music, physics, and mathematics. *Prereq.* INT 3550.

INT 3570 Determinants of Drug-Taking Behavior

Studies psycho-social factors present in substance abuse from youth through adulthood. Focuses on family, peers, media, environment, and lifestyle.

INT 3571 Substance Abuse Law, Policy, and Ethics

Offers an overview of the laws, policies, and ethics in substance use, misuse, and abuse on the local, state, and national level.

INT 3572 Internship

Presents a supervised field experience in a substance abuse program/agency for one quarter. Requires students to spend a minimum of six hours per week in the setting accompanied by a weekly seminar on campus. *Prereq.* CRS 3452, HSL 3670, INT 3570, and PCL 3145.

Institutes

CRS 3803, CRS 3804, CRS 3805, ED 3825, ED 3826, ED 3827, ED 3828, HSL 3822, HSL 3898, SLA 3699

A department may offer a special institute in a specific field of interest from time to time. The institute may be collaborative, offered by the several departments in the Boston-Bouvé College of Human Development Professions, and will usually include a special institute faculty drawn from resources outside the University, and from the Boston-Bouvé faculty. The institute focuses on a specific area of academic study and may be interdisciplinary in nature; it involves total time commitments on the part of participants in morning, afternoon, and evening sessions, five or six days per week, for one to eight weeks, depending upon the nature and scope of the institute. Institutes are customarily designed for participants who are currently employed in a common field of work and wish to receive additional preparation in new methods, new materials, and new content areas. Graduate credit may be granted for successful completion of an institute but may not be applied toward a degree program at the University without the approval of the departments in which students are doing their major field of specialization degree work. All institute participants must be degree candidates in the graduate school or must qualify, prior to registration, as special graduate students. *Prereq.* *Permission of institute instructor.*

Workshops

CRS 3806, CRS 3807, ED 3820, ED 3821, ED 3822, ED 3823, HSL 3823, HSL 3899, SLA 3698

A department may offer a special workshop in a specific field of interest from time to time. Emphasis in the workshop is focused on the development of instructional materials or the resolution of practical problems with a single school or institutional setting. Workshops may also be held for a group of potential participants who are currently employed in a common field of work. Graduate credit may be granted for successful completion of a workshop but may not be applied toward a degree program at the University without the approval of the departments in which students are doing their major field of specialization degree work. All workshop participants must be degree candidates in the graduate school or must qualify, prior to registration, as special graduate students. *Prereq.* *Permission of workshop instructor.*

Graduate School of Business Administration

All courses carry three quarter-hours of credit unless otherwise specified. Please see the current schedule for summer, fall, winter, and spring quarter listings.

ACC 3301 Financial and Managerial Accounting

Examines and evaluates financial and managerial processes to develop the participant's ability to request, use, and supply financial information. Includes financial statement analysis, funds flow, cost behavior, budgeting, capital investment analysis, and management control systems. *For nonbusiness majors.*

ACC 3811 Financial Accounting

Introduces the accounting system and the techniques of recording, summarizing, and reporting the flow of financial information through the entity concerned. Presents an examination of the information flow process plus the necessary techniques for analysis and evaluation of the firm's potential in the light of historical data.

ACC 3812 Management Accounting

Examines appropriate use of accounting and nonfinancial data for decision-making in and controlling of a business. Analyzes cost behavior as it relates to volume and profit for operation decisions and use of cost data in capital investment decisions. Studies techniques to develop and use comprehensive budgets for planning, motivating, coordinating activities and monitoring performance of a business and its functional components. *Prereq. ACC 3811.*

ACC 3813 Management Control Systems

Studies management control system as a key technique to assist a firm in achieving its goals and objectives. Topics include the process of translating long- and short-term goals into operating budgets, measuring performance for reward systems and assisting in decision-making, and specific techniques for evaluating performance. Emphasizes decentralized organizations with multiple operating divisions. Addresses developing, evaluating, and improving existing management control systems to respond to the firm's environment and goals through readings and case analysis. *Prereq. ACC 3812.*

ACC 3903 Management Control in Nonprofit Organization

Uses lectures and case studies to help students develop an understanding of the role of the manager in the nonprofit control process, the design and implementation of a new control system, and the management of a system which will adapt to changing environments and organizational needs. Topics include the characteristics of bureaucratic behavior and problems associated with implementing a control system where it may not be desired and understood; and methods of defining and relating the inputs and outputs of nonprofit organizations, including the use of cost accounting, capital and program budgeting, personnel systems, and benefit/cost analysis. *Prereq. ACC 3813.*

ACC 3918 Corporate Financial Reporting and Analysis 1

Investigates contemporary financial reporting problems. Discusses conceptual and pragmatic issues of income determination and financial disclosure. Emphasizes interpretation and analysis of alternative accounting treatments. Topics include inventory methods, plant assets, and long-term debt. *Prereq. ACC 3812.*

ACC 3919 Corporate Financial Reporting and Analysis 2

Continues examination of the financial reporting environment. Analyzes the economic consequences of complex transactions and related disclosures. Surveys current reporting requirements and analysis of recent developments in financial reporting. Topics include stockholders' equity, earnings per share, pensions, and leases. *Prereq. ACC 3918.*

ACC 3922 Auditing

Introduces the function of the public accountant. Covers matters of professional conduct and ethics, legal liability, generally accepted auditing standards, internal control, statistical sampling, audit reports, and the impact of electronic data processing on auditing. Although a conceptual approach is employed, covers auditing procedures as they relate to specific areas. *Prereq. ACC 3812.*

ACC 3962 Tax Factors in Business Decisions 1

Surveys the Internal Revenue Code and its implications for choice of organizational form, corporate reorganizations, and compensation policies. Examines mergers and acquisitions and the management of depreciable property in the light of decisions made by the Internal Revenue Service and the tax courts. Emphasizes tax planning and research into corporate income tax problems that affect business decisions. *Prereq. 15 QH of graduate credit and ACC 3812.*

ACC 3963 Tax Factors in Business Decisions 2

Aims to establish an in-depth understanding of selected tax planning topics: deferred compensation plans, mergers and acquisitions, small business organization, and business planning interactions with estate planning. *Prereq. ACC 3962 or permission of instructor.*

ENT 3922 Small Business Consulting

Helps students who have completed courses in the major functional areas achieve insights into the consulting sector of our business society. Emphasizes tools used in problem identification and in seeking realistic solutions for the small business manager. Requires each student to be assigned to a team that will be applying these skills with a small business in an attempt to find solutions to a real, current problem. Requires a final written report and oral presentation of this consulting assignment. *Prereq. 15 QH of graduate credit.*

ENT 3929 New Venture Creation

Gives students the opportunity to build a complete business plan for a new, high-potential venture. Covers all aspects of planning, from the point of view both of the prospective entrepreneur and the potential investor. Emphasizes the demand of an entrepreneurial career through readings, self-assessment exercises, and group projects. Presents guest speakers from start-up companies and legal and venture capital firms to provide up-to-date business experiences. Recommended for prospective entrepreneurs and others whose career activities may involve new ventures. *Prereq. 15 QH of graduate credit.*

ENT 3965 Management of Small Business Enterprises

Presents the operating problems of managing small enterprises. Explores case studies that develop analytical approaches for appraising the risks and rewards of potential growth opportunities, as well as operating problems. Presents problems that range from locating, evaluating, marketing, and financing a small company to the survival and growth of an established business. Presents guest speakers who relate pertinent business experiences to in-class activities. *Prereq.* 15 QH of *graduate credit*.

ENT 3968 Management of New Enterprises

Designed for students who are interested in either starting or working for small businesses. Explores how clever, effective marketing is essential for the growth of small companies. Explores the creation of a company image and establishing business strategy through market research and competitive analysis techniques suitable for the small business. In the context of a term project, teaches the various dimensions of implementing effective marketing programs for a small business, the market research for which includes surveying prospective customers and investigating competitors and suppliers. Results in a marketing plan for a new venture. Includes class readings, case analyses, and guest speakers from industry. *Prereq.* 15 QH of *graduate credit*.

FIN 3301 Financial Analysis

Traces the flow of funds within an organization, working capital management, capital markets, capital budgeting, and financial analysis. Builds on topics covered in ACC 3301. *For nonbusiness majors*.

FIN 3760 International Financial Management

Deals with the specific concepts, policies, and techniques for the financial management of the multinational firm. Topics include operations of the foreign exchange markets, managing foreign exchange risk, sources and instruments of international financing, foreign direct investment and the management of political risk, multinational capital budgeting, and financing control systems for the multinational firm. *Prereq.* FIN 3812.

FIN 3770 Small Business Finance

Utilizes the basic processes, principles, tools, and concepts of finances within the parameters of a small business to develop a complete financial plan. Constructs a comprehensive plan that projects the future circular flow of funds by analyzing and then integrating the impact of both investment decisions (use of funds) and financial decisions (source of funds). *Prereq.* FIN 3812.

FIN 3811 Financial Management 1

Presents concepts, practices, and procedures of financial management, and offers training in analytical approaches helpful in making wise decisions affecting the flow of funds available to an organization. Topics include financial analysis and forecasting, domestic and international working capital management, and an introduction to security types and markets. Instruction is primarily through readings and cases. *Prereq.* ACC 3812 and MSC 3802.

FIN 3812 Financial Management 2

Concentrates on long-term sources and uses of funds, including capital budgeting techniques, dividend policies, and the concept of cost of capital. Studies risk and return trade-offs. Studies broad topics of overall financial strategy and timing both domestically and internationally. *Prereq.* FIN 3811.

FIN 3901 Financial Strategy

Covers the opportunity to study several important areas of financial management in greater depth than is possible in the basic finance courses. Emphasizes strategies that financial managers can pursue to maximize the value of their firms. Instruction is primarily through reading and classroom case discussions. *Prereq.* FIN 3812.

FIN 3916 Capital Investment Decision Analysis

Analyzes capital budgeting techniques and portfolio considerations combined with an assessment of factors affecting a firm's capital structure. Considers company assets and how they should be financed. Explores the most recent developments in financial management. *Prereq.* FIN 3812.

FIN 3918 Working Capital Management

Examines strategies of and analytical approaches to managing current assets and current liabilities. Explores corporate cash management under changing money market conditions and discusses the use of interest rate futures and working capital management in a multinational context. *Prereq.* FIN 3812.

FIN 3920 Real Estate Investment and Analysis

Helps provide students with a comprehensive understanding of real estate finance. Emphasizes factors affecting real estate investment. Topics include valuation (appraisal), market analysis, development, taxation, ownership types, short-term financing, mortgage markets, and investment strategies. Designed for students interested in a general overview of real estate finance, as well as those intending to pursue a career in the real estate field. *Prereq.* FIN 3812 and MSC 3803.

FIN 3921 Investment Analysis

Focuses on the development of a sound investment program, with attention to identification of investment principles, objectives, and risks. Emphasizes the techniques of analysis, evaluation of various types of securities and the associated risks, the operation of the securities markets, and methods of portfolio management. *Prereq.* FIN 3812.

FIN 3923 Business Turnarounds

Concentrates on the diagnosis, prescription, and implementation of actions pertinent to business turnarounds, troubled companies, workouts, bankruptcies, and liquidations. Guides the student through the maze of financial, ethical, legal, general business, and strategic aspects of turnarounds by considering case studies and readings. Culminates in the student evaluating and developing a turnaround plan. *Prereq.* FIN 3811.

FIN 3924 Mergers and Acquisitions

Studies the environments that have recently given rise to a large number of corporate mergers and the business factors underlying these corporate combinations. Examines the financial, managerial, accounting, and legal factors affecting mergers. Teaches how to appraise a potential merger and structure a merger on advantageous terms. *Prereq.* FIN 3812.

FIN 3925 Investment Banking

Presents issues associated with policy, strategy, and administration of investment banking firms. Topics include issuance of securities, the service function of investment bankers, pricing a negotiated issue of common stock or competitive bid issue, and meeting capital requirements of a securities firm. *Prereq.* FIN 3812.

FIN 3926 Bank Management

Uses case studies and analyses to examine the management policies of commercial banks. Focuses on the lending, investment, and liquidity management policies of these financial institutions and the current issues and problems faced. *Prereq.* FIN 3812.

FIN 3927 Portfolio Management

Deals with portfolio construction, revision, and performance measurement. Highlights portfolio construction in an efficient capital market. Explores risk-return analysis, the effects of diversification on risk reduction, and the costs of inflation, taxes, and transaction costs of fixed income and equity security portfolios. Examines financial models of capital asset pricing as the basis for the analysis of portfolios from the institutional investor's viewpoint. *Prereq.* FIN 3921.

FIN 3928 Risk Management and Insurance

Introduces the concepts of risk and risk bearing in the business firm. Examines risk identification and analysis, measurement of loss possibilities, and the principal methods of managing such contingencies. Includes some nontraditional areas, such as speculative risk and foreign operations. Discusses insurance in detail as a major method of managing certain types of risks. Stresses aspects that directly relate to the financial management function, such as insurance markets and products, selecting insurers and insurer intermediaries, legal frameworks involved in the transfer of risk to insurers, pricing of insurance contracts, and principles followed by insurers in selecting risks. *Prereq.* FIN 3812.

FIN 3930 Speculative Markets

Familiarizes the student with all aspects of speculative markets, including options, futures, and options on futures. Uses readings and case problems to study when and how to use speculative market instruments. *Prereq.* FIN 3921.

FIN 3935 Management of Financial Institutions

Offers a broad study of the decision-making problems faced by financial institutions such as commercial banks, thrift institutions, pension funds, insurance companies, and finance companies. Topics include the nature and scope of the capital markets confronting these institutions, specialized problems regarding their sources and uses of funds, the nature of the competition,

regulatory constraints, and strategic policy planning of the financial institutions. *Prereq.* FIN 3812.

FIN 3950 Management of Investor Relations

Explores the scope and nature of the investor relations function. Describes various target audiences, reviews financial disclosure requirements, and discusses the effectiveness of various financial communication techniques. Focuses on the workings of the capital markets and the factors affecting a firm's stock price from the standpoint of the investor relations manager. *Prereq.* FIN 3812.

HRM 3301 Organizational Behavior

Serves as a critical component in preparing for increased responsibilities in the management of human resources. Studies leadership, group dynamics, motivation, power, business ethics, organizational structure, and change. Emphasizes practical application of specific skills, theories, and concepts. *For nonbusiness majors.*

HRM 3760 Managing People in International Settings

Covers basic issues in human resources management relevant to managing in international and cross-cultural environments. Topics include selection and training of personnel for work in multicultural environments, managing the international employee in the United States and abroad, cross-cultural communication, international environments, special issues of concern to small business, and change in multinational companies. *HRM 3815 and HRM 3816.*

HRM 3784 Human Resource Management in Health Organizations

Relates the traditional personnel (human resource management) functions: service, audit and control; the new functions: corporate policy formulation planning, advice and counsel, and innovation to the unique problems of health care organizations. Uses union organization and negotiation efforts, in cases and mock negotiation exercises, to focus on the conflicting issues between traditional personnel approaches, and the questioning of management authority and rights by unions and other regulatory policies and agencies. *Prereq.* HRM 3815 and HRM 3816.

HRM 3815, HRM 3816 Behavioral Concepts and Organizational Behavior 1

The first half of this two-course sequence involves major concepts and findings of the behavioral sciences that have particular pertinence to business and administration. Systematic ways of understanding behavior are developed. Specific topics include motivation, interpersonal perception and communication, and small groups processes. The second half of the course sequence relates these basic concepts to specific aspects of behavior in formally constituted organizations. Supervisory behavior is examined in the behavioral context, as well as in relations between groups, in efforts to develop ways of achieving collaboration.

HRM 3817 Organizational Behavior 2

Expands the study of behavior in organizations in order to understand and deal systematically with the complex relationships found in larger organizations. Provides an opportunity to apply knowledge about people

in organizations to the improvement of organizational systems and to the process of achieving changes in organizations. *Prereq. HRM 3815 and HRM 3816.*

HRM 3913 Managing Power and Influence

Explores through cases, readings, and videotape the complex issues involved in the use of power and influence in organizations and how to manage these issues in ways that are organizationally effective and socially responsible. Topics include the dynamics of power within organizations; the methods by which effective managers acquire and maintain power to manage critical dependencies and uncertainties; the important interdependency between power, influence and trust in organizations; analysis and action planning around one's own style of influence and use of power; the effects of these issues upon one's own career. *Prereq. HRM 3815, HRM 3816, and 15 QH of graduate credit.*

HRM 3920 The Management of Innovation

Innovation is the process of turning ideas into useful procedures or products. Students explore what the manager can do to foster, control, and direct innovation to accomplish the company's goals. Topics include the process of innovating, the role of the manager, and the selection of organization designs and systems that are some of the key components of innovation. *Prereq. HRM 3815 and HRM 3816.*

HRM 3945 Training and Developing Human Resources

Aimed at management generalists and human resource specialists who are concerned with maintaining organizational effectiveness through the upgrading of the basic skills and abilities of a broad range of employees. Emphasizes diagnosis of the organization to assess whether training and development is needed; techniques to decide who needs training; developing an awareness of the many types of training methods and their relative strengths and weaknesses for various groups of employees, and problem areas; and the design, implementation, and evaluation of training programs. *Prereq. HRM 3815 and HRM 3816.*

HRM 3948 Organization Development

Studies a recognized management discipline that uses behavioral science knowledge, action research, and specific intervention techniques to implement planned organizational change. Explores the relative advantages of strategies such as team building, process consultation, goal setting, conflict resolution, and structural modification. *Prereq. HRM 3815, HRM 3816, and 12 QH of graduate credit.*

HRM 3955 Compensation Management

Covers policies and techniques of wage and salary administration. Allows students to design and implement compensation plans using case data. Covers the technical aspects of developing a successful compensation program such as determining, weighing, and measuring compensable factors; assigning a total value to a job; grade collapsing procedures, reviewing wage and salary surveys; synchronizing internal with external salary structure; setting up "within grade" rate ranges; developing individual and group incentive compensation plans; developing group membership

rewards; estimating labor costs; controlling and utilizing the compensation systems and complying with government and union compensation policy. Uses cases and readings in a lecture/class discussion format. *Prereq. HRM 3815 and HRM 3816.*

HRM 3987 Leadership

Studies the processes and responsibilities of leadership in organizations. Uses a contingency approach that focuses on identifying different types of leadership behavior and on relating particular leadership styles to situational factors. Includes text, readings, and cases that allow for application of the concepts discussed and self-assessment techniques that allow the student to evaluate his or her own leadership qualities. *Prereq. HRM 3815 and HRM 3816.*

INB 3910 Managing the Multinational Enterprise

Deals with international operations at the multinational enterprise; the interface between the firm and the international business environment; current issues in United States public policy affecting international business competition with Japan and with LDCs. *Prereq. MEC 3809.*

NB 3911 Cultural Aspects of International Business

When a firm moves from its home culture to a host culture abroad, managerial issues become more complex. Managers enter negotiations and make contracts with counterparts whose goals and expectations may be quite different. Topics include strategies for assessing national cultures effectively, negotiation techniques, and case analysis of problems in various cultures. Primary focus will be on the perspective of the United States manager abroad with secondary focus on non-United States managers operating in foreign nations. *Prereq. 15 QH of graduate credit.*

MEC 3808 Managerial Economics 1

Presents macroeconomics for business managers. Acquaints students with the general economic environment and its impact on the firm. Topics include income and employment theory; classical, Keynesian, and monetarist models; aggregate demand and supply systems; money and capital markets; business cycles and the firm.

MEC 3809 Managerial Economics 2

Entails the application of microeconomic principles to the business firm and its competitive environment. Uses cases and readings to demonstrate the practical application of economic models in the decision-making process. Covers demand analysis, production and cost analysis, market structure, and pricing practices. *Prereq. MEC 3808 and MSC 3803.*

MGT 3750 Writing for the Professions

Examines the various forms of business communications and offers practical experience in writing business letters, memoranda, case studies, proposals, and reports. When possible, presents speakers from business and industry to address the class on various problems encountered in management and executive level communications. Requires several short (500-word) papers as well as one or two longer reports.

MGT 3834 Strategic Management 1

Focuses on the environment in which strategy must be formulated in profit and nonprofit organizations. Includes techniques of environmental analysis, with particular emphasis on the political-legal, economic, social, and technological environments as they relate to and influence the formulation of strategy. *Prereq.* All required courses with the exception of ACC 3813, HRM 3817, MGT 3835, and MGT 3836.

MGT 3835 Strategic Management 2

Building on the materials presented in MGT 3834, examines strategy formulation. Emphasizes the process by which strategy is formulated in actual business settings, including the influence of personal values on strategy formulation, who actually makes strategic decisions, what environmental and internal information is required to make strategic decisions, and what criteria are used to make the decisions. Considers the role of different management levels in the process. *Prereq.* MGT 3834.

MGT 3836 Strategic Management 3

Compares and contrasts the approaches to strategy implementation in profit and nonprofit organizations. Topics include organizational structure and behavior, long-range planning, control and motivation systems, information systems, and leadership. Considered within the systems framework of organizational strategy. *Prereq.* MGT 3835.

MGT 3915 Business and Professional Speaking

Designed to give the students an opportunity to develop and deliver oral presentations as they apply to various business settings—focus is on formal as well as informal speaking situations. Stresses helping the student develop skills in dealing with a variety of communication situations. *Prereq.* 15 QH of graduate credit.

MGT 3917 Managerial Communication

The ability to communicate effectively is an important dimension of managerial success. This course deals with a variety of communication contexts and emphasizes improving skills in each context. Students may have the opportunity, through simulations and exercises, to develop individual skills.

MGT 3919 Interpersonal Communication

Explores ways in which we relate to other individuals and factors that influence these processes. Through class discussion, readings, and individual and group projects, examines effective listening behaviors, small group/conference techniques, leadership styles, and methods of team-building. *Prereq.* 15 QH of graduate credit.

MGT 3939 United States Competitiveness in a Global Economy

Explores the distinctive problems of formulating and implementing strategy in global businesses. Discusses and analyzes new trends affecting the international competitiveness of United States firms and possible responses. Encourages participants to view problems from the perspective of foreign firms and foreign governments, in addition to those of United States firms

and the United States government. Covers a range of economic sectors and countries. Requires students to work on an in-depth project. *Prereq.* MGT 3834 and MGT 3835.

MGT 3940 The Chief Executive Officer

Focuses on the job perspective of the chief executive officer of business organizations. Focuses on presentations by and discussions with chief executives of major companies in the Greater Boston area. Includes case studies and other literature addressing the job, problems, and opportunities of top managers. Enrollment will be limited. *Prereq.* 30 QH of graduate credit.

MGT 3970 Business and Society: Managing Social Issues

Analyzes environmental influences—economic, legal, technical, social, cultural, and ethical—affecting the corporation. Focuses on reconciling the strains generated by these external factors and their impact on managerial decision making. *Prereq.* HRM 3816 and 12 QH of graduate credit.

MGT 3971 Ethics in Management

Is business ethics intrinsically a contradiction in terms? We will examine—through cases, contemporary issues, and theoretical concepts—whether ethical analysis can and should be applied to managerial decisions. While philosophical ideas will be discussed, this is not so much a presentation of those schools of thought or an attempt to establish prescriptive norms for business. Rather, we will apply moral reasoning to real situations in an effort to decide whether business can conduct itself in ways that are both profitable and proper.

MGT 3973 Business and Government Regulation

Studies the process by which regulations are formulated at the various levels of government and the impact on business: the regulation of prices, safety, environment, energy, and consumer rights. Emphasizes particular industries: transportation, communication, energy, health care, and finance. Attempts to enhance the ability of managers to respond to and deal with government regulation, which today significantly affects most aspects of business.

MGT 3975 Introduction to Health Care Systems

Explores the current state of the system, dealing with its history and process, and describing the parts of the delivery system, the payers, the consumers, the manpower, and the policy implications. Includes comparison of health care systems, lectures, discussions, and readings. Recommended for those entering the field. *Prereq.* 15 QH of graduate credit.

MGT 3976 Cases in Health Care Finance and Operations

Examines decision making in health organizations emphasizing financial considerations, the effect of government regulation, and third party reimbursement policies. Uses frequent case studies to present financial statement analysis, financing decisions and resource allocation, including new program and facility development. Requires students to prepare cases and to take part in class discussions. *Prereq.* ACC 3812 and FIN 3811.

MGT 3977 Health Care Delivery Systems

Introduces graduate management students to the United States health care delivery system by presenting an overview of its parts while providing and understanding of the interrelational dynamics and, at times, conflicting goals. Highlights the interaction between the health care delivery system and the external environment, including the changing viewpoints, issues, and major social trends.

MGT 3986 Health Care Strategic Marketing

Focuses on how health care organizations are increasingly turning to strategic planning and marketing to achieve objectives. Examines the strategic planning process in hospitals and other provider institutions and the complementary activities of marketing personnel. Explores the role of key constituents—such as, patients, trustees, senior managers, and medical staff—in strategic planning and marketing activities showing how the process of competitive analysis and internal organization evaluation and restructuring are key elements for success.

MGT 3991 Legal Aspects of Business

Provides an understanding of the American legal system with an emphasis upon the resolution of corporate legal disputes by means of civil litigation, mediation, arbitration, and the corporate mini-trial. Examines the traditional areas of contract law and tort law as they relate to problems confronting the modern corporate manager. Scrutinizes the legal structure of the corporation and focuses upon agency issues, computer law, and the preservation of intellectual property. Reviews government regulation of business including anti-trust law and labor law.

MGT 3997 Special Studies in Business Administration 1 QH

Offers a special tutorial arrangement between a student and a faculty member for a guided reading, research, laboratory, fieldwork, report, or teaching experience. Recommended for graduate students who desire to do advanced work or carry out special investigation of a problem in business administration not specifically covered in the curriculum. Requires students to petition the Committee on Graduate Study in Business Administration for permission to register for this course. *Prereq.* 15 QH of graduate credit.

MGT 3998 Special Studies in Business Administration 2 QH

See MGT 3997 for course description.

MGT 3999 Special Studies in Business Administration

See MGT 3997 for course description.

MKT 3301 Marketing

An organization's link to its market is a crucial aspect of the management process. This course begins with market analysis and market research and builds on the planning framework examining product, pricing, advertising, sales management and distribution. For nonbusiness majors.

MKT 3760 International Marketing

Helps students develop understanding of the opportunities and challenges facing the international marketing executive; the decision-making process in marketing goods abroad; and the environmental forces—economic, cultural and political—affecting the marketing process in the international marketplace. Includes lectures, discussions, reports, and cases. *Prereq.* MKT 3812.

MKT 3811 Marketing Management 1

Presents the student with a comprehensive examination of basic marketing functions, institutions, and concepts; and helps develop the student's ability to analyze and make recommendations about business problems that involve the creation, distribution, and sale of goods and services. Emphasizes the definition of marketing problems, demand analysis, consumer analysis, and marketing research.

MKT 3812 Marketing Management 2

Continues MKT 3811, with emphasis on the formulation and implementation of marketing strategy. Stresses product policy, channels of distribution, pricing, advertising, personal selling, and the development of integrated marketing programs of action. *Prereq.* MKT 3811.

MKT 3914 Consumer Behavior

Offers development of an understanding of consumer attitudes and behavior processes. Examines and evaluates various economic and behavioral models of consumer behavior as bases for the planning and evaluation of marketing strategies. *Prereq.* MKT 3812.

MKT 3916 Workshop in Negotiating

Helps improve the students' understanding of the negotiations process and their ability to plan and conduct negotiations effectively. Involves readings, lectures, and discussions as well as numerous case discussions and live and videotaped role-play negotiation exercises. *Prereq.* MKT 3812 and HRM 3816.

MKT 3922 Brand Management

Emphasizes the process of new consumer product development, the management and development of product strategies, and management of the product mix in the multiproduct firm. Topics include identification and screening of new product opportunities, evaluation of product performance, segmenting the product market, diversification and simplification of the product line, and the management of innovation. *Prereq.* MKT 3812.

MKT 3926 Advertising Management

Explores management of the advertising function from the perspective of users such as product managers. Uses case studies and text materials to explore the role of advertising, target market identification, creative strategies, media planning, and advertising evaluation. Emphasizes coordination of advertising with marketing elements and overall corporate strategy. *Prereq.* MKT 3812.

MKT 3931 Marketing Research

Discusses major methods of marketing research. Emphasizes research design issues—sampling, data

collection procedures, and questionnaire construction—rather than data-analysis procedures. Examines sources of error in surveys in detail, along with the appropriate methodological techniques designed to reduce their magnitude. Evaluates surveys in terms of their ability to provide quality information. *Prereq. MKT 3811 and MSC 3802.*

MKT 3932 Statistical Methods for Marketing Research

Focuses on various statistical methods of design and analysis in marketing research. Topics include non-parametric statistics, experimental design, correlation and regression analysis, multiple discriminant analysis, and factor analysis. Uses canned statistical programming routines with actual survey data to illustrate the application of the methods discussed. This course may be taken independently of MKT 3931. *Prereq. MKT 3811 and MSC 3802.*

MKT 3934 New Product Development

The importance of new products to the survival and prosperity of firms increases as product life cycles become shorter, as technology, competition, and consumer tastes change; and as operating costs increase. For most firms, coping with the problems of environmental change through modification of the product line is vital and difficult. This course will have as a primary concern the examination and analysis of some of the problems firms face in directing and managing their new product development activities. *Prereq. MKT 3812.*

MKT 3936 Retail Management

Analyzes the evolution of retail institutions and examines selected major strategy and policy problems of food, apparel, and general merchandise retailers. Explores cases and issues from the viewpoint of the managements of supermarket, department store, specialty store, and discount enterprises. Designed primarily for students interested in retailing and those concerned about the role of mass distributors in marketing consumer goods. *Prereq. MKT 3812.*

MKT 3940 Defense Marketing

Conducted in a seminar format, with emphasis upon defense marketing in its totality, including analysis of participant roles, contractual foundations, contractor performance, and marketing activities. Topics include the overall defense acquisitions process, market characteristics, program management, procurement methods, sales and negotiation techniques, and related marketing management factors. *Prereq. MKT 3812.*

MKT 3941 Industrial Marketing

Considers the problems of industrial concerns in marketing products and services to industrial, business, and organizational customers. Emphasizes determining customers' needs and developing programs to satisfy these needs. Topics include the roles and responsibilities of the marketing executive engaged in industrial distribution advertising, and research, as well as roles and responsibilities of industrial salespeople, sales supervisors, and selling agents. *Prereq. MKT 3812.*

MKT 3945 Sales Management

Helps develop the decision-making skills necessary to build and maintain an effective sales organization.

Uses cases and readings to examine the strategic and operating problems of the sales manager. Topics include the selling function; sales management at the field level; the sales executive; and sales and marketing management. *Prereq. MKT 3812.*

MKT 3952 Marketing for Nonprofit Organizations

Explores the extension of marketing concepts, practices and principles to organizations outside the business sector. Applies marketing methods to nonprofit organizations such as governmental agencies, educational institutions, charitable organizations, social cause agencies, and political candidates. Emphasizes the development of integrated marketing plans for the various nonprofit organizations. *Prereq. MKT 3812.*

MKT 3955 Marketing in High-Tech Industries

Offers study for students who already have a good background in marketing but who are now interested in analyzing the special marketing problems that high-tech industries pose. Topics include the use of market research when customer preferences are not yet developed, the use of sales and service forces, and the use of marketing as a strategic variable. *Prereq. MKT 3811.*

MKT 3966 Marketing in the Service Sector

Deals with public and private profit and nonprofit institutions which market services. Includes insurance, transportation, utilities, entertainment, health care, education, religious, sports, banking, artistic, and protective. Combines case discussions, textbooks, and outside readings for a balanced approach for the development of marketing skills. Defines, classifies, and analyzes service characteristics from the perspective of their effect on marketing methods and institutions. *Prereq. MKT 3812.*

MKT 3975 Health Care Marketing

As the health service environment becomes increasingly competitive and complex, health service organizations use sophisticated marketing tools to identify and manage marketing opportunities and distribution strategies. Students will examine different health service marketing applications in the context of service marketing through case analysis, readings, and a project. Specific marketing techniques will be addressed within a strategy framework. *Prereq. 15 QH of graduate credit.*

MKT 3978 Competitive Strategy

Serves as a capstone course for graduate students emphasizing the marketing area in their studies. Pulls together the various functional, institutional, and strategic elements that marketing comprises and to which the student has been exposed in previous coursework. *Prereq. MKT 3812.*

MSC 3301 Operations

Explores the strategic nature of operations planning. Stresses capacity planning, quality control, product liability, production scheduling and control. Highlights the interdependence of sound financial planning, effective marketing strategies and corporate decision making. *For nonbusiness majors.*

MSC 3780 Operations Management in Health Care Organizations

Hospitals and other health services organizations provide costly, varied, and sophisticated human and capital resources to maintain and improve the lives of those served. The operations management function in health organizations encompasses planning, coordinating, and controlling these complex resources in order to satisfy, at reasonable costs, current and anticipated client needs. The concepts, tools, techniques, applications, and cases appropriate to a discussion of the planning and control of efficient, effective, and equitable health services organizations are presented. Topics include capacity planning, facility location, forecasting, process and job simulation and quality control. Designed for individuals interested in careers in health care administration. *Prereq.* MSC 3805.

MSC 3802 Quantitative Analysis 1

Examines the process of statistical inference, whereby the analyst is enabled to infer or draw conclusions about the parameters of a large data set on a basis of sample statistics. Topics include the generation of subjective probabilities, the revision of probabilities to incorporate new information, and the incorporation of probabilities into the decision-making framework.

MSC 3803 Quantitative Analysis 2

Introduces the theory and practice of management science. Discusses regression analysis, linear programming, and simulation in text and case material. Stresses practical application of the techniques. Considers problem definition, model building, relevant cost determination, solution generation, and implementation of results. *Prereq.* MSC 3802.

MSC 3805, MSC 3806 Operations Management 1, 2

Helps develop an understanding of the management of operating systems. Examines the design, operation, control, evaluation, and modification of systems that produce goods and services. Attempts to increase the student's decision-making capabilities in technical areas and develop an appreciation for the operations manager's job, and provide an understanding of interrelations with other functional areas. Topics include design of product and process, capacity planning, line balancing, work measurement, job evaluation, network scheduling, production planning, inventory management, production scheduling and control, and quality control. MSC 3805 concentrates on the design of the operating system; MSC 3806 focuses on its operation and control. *Prereq.* For MSC 3806, MSC 3803.

MSC 3832 Introduction to Computer Applications

Provides a business-oriented introduction to data processing functions and systems. Introduces history, terminology, technology, and economics of data processing hardware and software. Considers management issues in the design, selection, evaluation, and use of computers and computer services. Offers individual familiarization with personal computers and popular business software. *Prereq.* Satisfactory completion of computer programming requirement.

MSC 3909 Quality Management and Control

Focuses on the need for quality assurance in both the manufacturing and service sectors, the technical and statistical tools used in quality assurance, and the concept of total quality. Topics include the history of quality assurance in the United States and Japan; managerial issues related to quality assurance, including the concept of total quality control, the role of quality as a strategic tool, and human resource factors in the management of quality; and managing and controlling quality in service industries. *Prereq.* MSC 3802.

MSC 3910 Decision Analysis

Decision analysis is a discipline for systematic evaluation of alternative actions. In selecting among alternative strategies, the decision maker must consider future events and subsequent actions that could exert a significant influence on the consequences of selecting a given strategy; the likelihood of each such event occurring; the consequence associated with the occurrence of each such event in conjunction with the action alternative being evaluated; and the relative desirability of each consequence. The process for quantifying each of these and dealing with their interrelationships is examined within the unifying framework of the decision tree. *Prereq.* MSC 3802.

MSC 3911 Manufacturing Policy

Focuses on strategic operating decisions typically addressed by the vice president of manufacturing operations, such as capacity expansion, the impact of new products and/or processes, product allocation to plants, and vertical integration. Emphasizes how these decisions impact the competitive position of a firm both now and in the future, which helps the students understand the totality of a top management situation where the interactions between corporate and manufacturing strategies are most evident. Includes case studies, reference notes, and articles. Recommended for students who currently are in, or expect to be in, positions of major responsibility in manufacturing/operations, and also for students who must possess the qualifications to analyze the manufacturing capabilities of companies, such as those in investment banking, finance, and consulting. *Prereq.* MSC 3806.

MSC 3912 Contemporary Issues In Manufacturing Management

Considers recent significant developments in manufacturing technology and their managerial implications. Provides an understanding of modern manufacturing systems and their associated operations management problems, and to develop the decision-making ability necessary for the effective management of such systems. Topics include automation, group technology, just-in-time production, and computer-integrated manufacturing. Includes lectures, reading cases, and a field project. *Prereq.* MSC 3806.

MSC 3914 Performance Criteria and Incentive Systems

Presents the stages required for implementing an effective performance criteria system in an organization: selecting performance criteria, measuring performance, and establishing standards. Describes various financial incentive systems to increase motivation for

improved performance. Reviews individual, group, and organizational incentive systems. Participants may be able to design and implement systems by the end of the quarter. *Prereq.* MSC 3805.

MSC 3916 Competitiveness in Manufacturing Operations

Takes an integrated and global approach toward manufacturing in order to formulate strategies for higher profit, higher quality, and lower inventory and operating costs. Analyzes different types of firms and manufacturing problems using lectures, readings, cases, and a term project. *Prereq.* MSC 3806.

MSC 3922 Data Analysis

Analyze small and large data sets in the context of a model and graphical methods. Emphasizes the dual goals of data analysis: discovering hidden interesting features of data and how such characteristics affect the estimates of model parameters. Introduces students to new and novel methods of computer intensive methods in statistics. Requires analysis and interpretation of data sets related to students' field of interest. *Prereq.* MSC 3802 and MSC 3803.

MSC 3933 Management Information Systems

Deals in depth with the analysis, design, implementation, and operation of modern management information systems. Uses case studies as the primary vehicle to illustrate all phases in the creation and management of computer-based systems. Emphasizes management issues rather than computer technology or programming. Designed to follow MSC 3832, this is a logical second computer course that an MBA candidate might take. *Prereq.* MSC 3832.

MSC 3936 Database Management Systems

Provides management-oriented introduction to database management systems (DBMS). Topics include rationale for the DBMS approach, database design, data models, DBMS software tools, conversion to a database environment, and the role of the database administrator. Allows students to use a DBMS package, gain experience in database design, use a query language, and develop DBMS applications. *Prereq.* MSC 3832.

MSC 3940 Data Communications for Managers

Presents a nontechnical introduction to data communications for the general manager. Improves the manager's knowledge of critical aspects of this rapidly expanding and increasingly important field. Surveys the most important aspects of modern local and remote communications systems. Topics include fiber optics, microwave transmission, networking, and switching. Gives students the opportunity to design several prototype communications configurations. *Prereq.* MSC 3832.

MSC 3963 Expert Systems

Familiarizes the student with the potential of expert systems (ES) for management problem-solving. Topics include the position of ES in the larger field of artificial intelligence, components of an ES, various levels of languages for ES construction, determination of problem areas suitable for the application of ES technology, analysis of several existing ES applications, and future potential for this technology. Uses case and readings.

Teaches one of the most popular ES languages. Includes a project on one of several aspects of ES application. *Prereq.* MSC 3832 or MSC 3933.

TRN 3903 Corporate Transportation/Logistics

Focuses on the design and management of corporate transportation and logistics systems. Emphasizes the analytical framework which is employed in making complex distribution tradeoffs. Topics include inventory control, location analysis, transportation planning, and the integration of logistics planning with other functional aspects of the organization. *Prereq.* 15 QH of graduate credit.

Graduate School of Computer Science

All courses carry four quarter-hours of credit unless otherwise specified. All courses have COM 1201 Data Structures as a prerequisite, in addition to those listed.

COM 3112 LISP**2 QH**

Introduces computer scientists to LISP, emphasizing the use of LISP in artificial intelligence.

COM 3114 "C"/UNIX Laboratory**2 QH**

Introduces "C" programming language. Studies reading and writing the language, learning to use UNIX commands and application programs, and UNIX system calls and subroutines.

COM 3115 PROLOG**2 QH**

Covers PROLOG syntax, data structures, backtracking and "cut", debugging, applications, and the relation of PROLOG to logic.

COM 3200 Computer Architecture

Studies the design of digital computer system components, including the arithmetic and logic unit, the control unit, the memory and memory controller, and interconnection networks. Explores modern design techniques for increasing computer system capacity. Topics include pipelining, cache, RISC architecture model, multiprocessing and parallel processing architectures, systolic systems, dataflow architecture, and associative memories. *Prereq.* COM 3336.

COM 3205 The Software Life Cycle

Presents a comprehensive review of the software development field. Examines the "software crisis" and the need for methods and software lifecycle paradigms such as waterfall, prototyping, executable specifications, and incremental development. Discusses requirements analysis, specification methods, software design principles and methods and software verification testing. Explores project management, cost estimation, metrics, implementation issues, document design, and maintenance. Emphasizes data abstraction and module integration. Includes a project covering the requirements specification, design, and coding phases of software development. Provides initial documentation that is text-based, with CASE tools introduced later.

COM 3210 Software Specification, Design, and Maintenance

Focuses on issues of documenting and modifying large programs, possibly written by others. Uses CASE tools for analyzing and documenting a large software system. Emphasizes differing design representations and conveying the inner working of a complex software system. Reviews data abstraction and object-oriented programming. Emphasizes also debugging tools, including dbx, make, lint, tags, and RCS, or their equivalent in a non-UNIX environments. A typical project generates CASE-based documentation for preexisting software and uses the documentation to design and add enhancements. *Prereq.* COM 3205.

COM 3220 Software Testing, Verification, and Validation

Studies unit testing, including functional testing and its relationship to the specification, structural testing, and error-oriented testing and analysis. Discusses managerial aspects of unit testing and analysis. Examines verification and validation, including objectives, theoretical limitations, integration and system testing, and regression testing. Considers simulation and prototyping, requirements tracing, proof of correct-

ness, code reviews, and planning for verification and validation. Reviews formal verification methods, including Hoare logic, weakest preconditions, and others. *Prereq.* COM 3205.

COM 3315 Database Systems

Considers the concepts and structures necessary to design and implement a database application. Introduces to database concepts, database modeling, and hierarchical, network, and relational models. Topics include data definition and manipulation languages, design theory for relational models, integrity, security, recovery, and concurrency in database systems.

COM 3316 Physical Database Engineering

Studies the specification, design, and implementation of database management systems. Discusses the access characteristics of secondary storage devices, and analyzes primary and secondary access methods for performance of database operations and for storage space. Topics include query optimization methods, hashing techniques, lock tables, search structures, sorting methods, and techniques to evaluate design alternatives and tradeoffs. Requires a project involving physical database structures. *Prereq.* COM 3315.

COM 3317 Data Modeling

Presents the theoretical foundations of existing and proposed database systems. Considers the semantics of database systems and data modeling. Introduces the theory of normalization, logic databases, knowledge bases, and object-oriented databases. *Prereq.* COM 3315.

COM 3329 Topics in Database Management

May be repeated for credit. *Prereq.* Permission of instructor.

COM 3336 Operating Systems 1

Studies the design and implementation of an operating system. Reviews algorithms for concurrent processes, deadlock resolution, process management, performance evaluation, and monitoring. Students work on a project implementing a small operating system or extending an existing one. *Prereq.* COM 1130.

COM 3337 Operating Systems 2

Continues COM 3336. The first part of this course will continue to study the design and implementation of operating systems through the examination of a specific system. In the second part of the course, more emphasis will be placed on operating systems in general and a variety of solutions to the central problems in the field will be studied and compared. Topics covered may include memory management, scheduling, mutual exclusion, deadlock, disk drivers, interprocess communication, and file systems. Students will be expected to carry out a substantial project involving modification of an existing operating system. *Prereq.* COM 3336.

COM 3349 Topics in Operating Systems

May be repeated for credit. *Prereq.* Permission of instructor.

COM 3350 Theory of Computation

Studies partial recursive functions and recursively enumerable sets, turing-decidability, and unsolvable problems. Discusses of computational complexity, the class P and NP, and some NP-complete problems. *Prereq.* COM 3390 and either COM 1350 or COM 3345.

COM 3351 Principles of Programming Languages

Considers the basic components of programming languages, including specification of syntax and semantics. Presents the derivation of languages processors from their specifications, and describes programming language features. Includes examples from a variety of languages.

COM 3355 Compiler Design

Explores the basic components of compilers, with an emphasis on using a standard compiler-writing tool such as yacc, tws, or ssl. Thus, parsing is not a major part of this course. Writing a small compiler using the compiler-writing tool may be required. Topics include an overview of the stages of compilation, attribute grammars, symbol tables, abstract syntax trees, run-time structure, and code generation. *Prereq.* COM 3351.

COM 3356 Optimizing Compilers

Studies the code generation phase of compilers, with emphasis on production of efficient object code. Topics include immediate code representations, flow analysis, local and global optimization, peephole optimization, register allocation, and methods for code generator generation (table-driven code generation, Graham-Glanville techniques, etc.). *Prereq.* COM 3355.

COM 3357 Semantics of Programming Languages

Offers the mathematical models for the behavior of programming languages, including reading and writing denotational specifications. Considers the lambda-calculus, and emphasizes the practical use of the techniques covered, such as rapid prototyping and debugging specifications. *Prereq.* COM 3351.

COM 3360 Object-Oriented Systems

Discusses the basic components of object-oriented systems: programming languages that support the object-oriented paradigm, object-oriented databases, and their interfaces. Considers methodologies for developing applications with object-oriented systems, as well as design space for object-oriented programming languages. Reviews the maintenance and evolution of object-oriented applications. Includes programming assignments using a widely available object-oriented programming language. *Prereq.* COM 3351.

COM 3370 Advanced Computer Graphics

Discusses selected topics chosen from the following list: area fill algorithms, aliasing problem in line drawing, three-dimensional graphics, geometric transforms, hidden surface algorithms, curve and surface approximation techniques, solid primitives, color and shading, approaches to obtaining realistic images. *Prereq.* An introductory course in computer graphics.

COM 3371 Digital Image Processing

Studies the fundamental concepts of digital image processing, including digitization and display of im-

ages, manipulation of images to enhance or restore image detail, encoding (compression) of images, detection of edges and other object features in images, and the formation of computed tomography (CAT scan) images. Introduces mathematical tools such as linear systems theory and Fourier analysis and uses them to motivate and explain these image processing techniques.

COM 3390 Analysis of Algorithms

Examines the design and analysis of fast algorithms. Topics are chosen from the following list: advanced data structures (representing partitions, union-find algorithms, priority queues) graph algorithms (biconnectivity, maximum flow, shortest path, matching, minimum spanning tree) algebraic problems (matrix multiplication, polynomial multiplication, string matching, linear programming) probabilistic algorithms (tests for primality, factoring polynomials and integers). *Prereq.* MTH 1137.

COM 3399 Topics in Programming Languages and Systems
May be repeated for credit. *Prereq.* Permission of instructor.

COM 3410 Foundations of Artificial Intelligence

Studies searching, goals, plans, and heuristics. Examines representation of knowledge, including frames, nets, and inheritance. Explores logic and its role in artificial intelligence, and selected applications of these ideas in other areas of artificial intelligence. *Prereq.* Working knowledge of LISP (same as MTH 3522).

COM 3411 Methods of Artificial Intelligence

Offers hands-on experience in the development and use of AI tools such as: search with backtracking (chronological, dependency-directed) and heuristic search, blackboard models, default reasoning, inference engines (unification and resolution), object-oriented programming (flavors and Loops), procedural attachment, plan-generate-test in problem solving, production systems, rule spaces, distributed representations, augmented transition networks and their compilation. *Prereq.* COM 3410.

COM 3420 Knowledge Representation and Inferencing

Presents knowledge representation, acquisition, and utilization. Considers frames, scripts, conceptual dependency, forward and backward chaining, unification and resolution, and non-monotonic reasoning. Includes rote learning, learning by analogy, consistency checking. *Prereq.* COM 1410 or equiv.

COM 3425 Logic in Artificial Intelligence

Focuses on formal logic as related to intelligence and human reasoning, and gives a brief review of the formal properties of "standard" logic. Discusses logic in artificial intelligence systems and languages, as well as limitations of standard logic as a model of intelligent behavior. Studies extensions of standard logic including modal/temporal logics, fuzzy logic, logic of action and belief, non-monotonic logic, and intensional logic. *Prereq.* COM 3411.

COM 3430 Expert Systems

Introduces expert systems and how to build them. Focuses on techniques and tools, classical systems, and research in automated methods. Assignments intro-

duce students to various languages and tools. Requires a project or term paper. *Prereq.* COM 3410.

COM 3440 Natural Language Processing

Investigates the goals and problems of Natural Language Processing (NLP) and studies the grammatical models and associated parsing algorithms. Considers models of natural language semantics: case grammar, semantic networks, formal logic, and frames. Discusses current research on models of discourse, speech act planning, and robust parsing methods. Examines some implemented systems for NL understanding. *Prereq.* COM 3410.

COM 3450 Syntactic Pattern Recognition

Introduces syntactic pattern recognition and comparison with the classical discriminant approach. Surveys various syntactic pattern recognition techniques, such as PDL, array grammar, formal languages, tessellation structures. Examines syntax analysis as a recognition procedure and grammatical inference for recognition. Considers applications to selected problems in industry, commerce, medicine, and robotics. *Prereq.* COM 1350 or COM 3345.

COM 3460 Intelligent Computer-Assisted Instruction

Analyzes the notion of course material independent of teaching procedures. Explores problems and comments individualized for each student, and system tutors with reactive learning environments. Includes examples for SCHOLAR and GUIDON, and group development of intelligent instructional systems.

COM 3470 Computer Vision

Discusses low-level vision. Develops methods that assemble the low-level elements into coherent wholes based on models of scenes using world knowledge in the appropriate domains. Topics include classification, robot vision, moving image analysis, and cognitive models of vision (gestalt effects, texture perception, subjective contours, illusions, apparent motion and mental rotations, cyclopean vision, etc.). *Prereq.* COM 3410.

COM 3480 Connectionist Models of Learning

Considers machine learning, focusing on connectionist, or neutral network, models. Topics may include the notion of "concept," perceptions and their limitations, linear machines, and the pocket algorithm. Other topics may include distributed representations, the credit assignment and learning in networks, Boltzmann machines, Rumelhart's back propagation algorithm, tower construction, sequences, the neocognitron of Fukushima, and connectionist expert systems. Requires preparation of either a project or a term paper. *Prereq.* COM 3410.

COM 3499 Topics in Artificial Intelligence

May be repeated for credit. *Prereq.* Permission of instructor.

COM 3510 Computer Communications Networks: Design and Performance

Studies interacting computers. Topics include elementary queueing theory, connectivity theory, data link and transport protocols, slot rings, token rings and CSMA, routing algorithms, and performance analysis

of networks. Additional topics may be chosen from models of networks or of network protocols, error detection and correction, and applications protocols such as virtual terminal or file transfer protocols. *Prereq.* MTH 1137.

COM 3520 Cryptography and Computer Security

Presents the design and use of cryptographic systems and cryptanalytic attacks and provides a history of cryptographic systems and the mathematics behind them. Considers shift register sequences, random number generators, DES, as well as public key systems and their applications. *Prereq.* COM 1350, and COM 3345 or MTH 1137.

COM 3560 Distributed Database Systems

Addresses the problems and opportunities inherent in high performance and distributed database systems. Considers the concurrency control and recovery management methods, methods for improving performance and availability, and the management of replicated data. *Prereq.* COM 3315.

COM 3630 Concurrent Programming

Explores the logical problems that arise in concurrency and their machine implementations. Considers mutual exclusion, message passing, deadlock, monitors, kernels, and applications to operating systems. *Prereq.* COM 3336.

COM 3640 Parallel Algorithms

Studies algorithms and theories for parallel computation on fixed-connection networks and on concurrent systems having a fixed number of processors. Focuses on algorithms for sorting, priority queues, graph algorithms, matrix multiplication, and FFT. Students use a network for micros to implement some of these algorithms. May include applications to VLSI design. *Prereq.* COM 3336 and COM 3390.

COM 3699 Topics in Computer Architecture and Hardware

May be repeated for credit. *Prereq.* Permission of instructor.

COM 3710 Automata and Formal Languages

Examines formal models of computation and regular expressions. Discusses the properties of regular sets, context-free languages and pushdown automata, Chomsky hierarchy, and computability and undecidability. *Prereq.* MTH 1137 (same as MTH 3521).

COM 3730 Complexity Theory

Presents the theory of relationships among complexity classes of algorithms. Examines sequential, deterministic, parallel, non-deterministic, and probabilistic models of computation, as well as turing and decision tree models. Considers the class NP, and addresses questions of completeness, especially NP-completeness, reducibility, and hierarchy of complexity classes. *Prereq.* COM 3350 (same as MTH 3535).

COM 3741 Algebraic Algorithms

Offers topics in algebraic algorithms chosen from the following list: computational group theory, computational number theory, algorithms for computing with

finite fields, and the discrete Fourier Transform and its applications. Other topics may include the Knuth-Bendix algorithm for finitely presented algebras, polynomial factorization, and related topics in computer algebra (*same as MTH 3514*).

COM 3761 Numerical Analysis 1

Surveys the problems, issues, and techniques of numerical analysis. Considers problems such as root finding, curve fitting, numerical integration, large linear systems of equations, and ordinary differential equations. Addresses such issues as tradeoffs, for example, cost versus precision and speed versus space. Requires some programming. *Prereq. FORTRAN or Pascal (same as MTH 3361)*.

COM 3762 Numerical Analysis 2

Studies the numerical solution of partial differential equations, emphasizing elliptic equations and the finite element method. *Prereq. COM 3761 (same as MTH 3362)*.

COM 3799 Topics in Theoretical Computer Science

May be repeated for credit. *Prereq. Permission of instructor.*

COM 3800 Readings in Computer Science

Offers selected readings under the supervision of a faculty member. *Prereq. Core courses and permission of instructor.*

COM 3805 Readings in Computer Science 2 QH

Requires selected readings under the supervision of a faculty member. *Prereq. Core courses and permission of instructor.*

COM 3810 Special Topics in Computer Science

Faculty will lecture on current topics in computer science. Topics will vary from quarter to quarter. May be taken up to three times for credit, with changes in topics. *Prereq. Core courses or permission of instructor.*

COM 3820 Computer Science Master's Thesis

May be repeated for credit. *Prereq. Agreement of a thesis adviser.*

COM 3821 Computer Science Master's Thesis 0 QH

Continues COM 3820.

COM 3830 Computer Science Master's Project

May be repeated for credit. *Prereq. Agreement of a project supervisor.*

COM 3840 Seminar in Computer Science

Provides an opportunity to read and present various survey and research papers in computer science. Faculty supervisor and topics will vary from quarter to quarter. May be repeated for credit. *Prereq. Core courses or permission of instructor.*

COM 3890 Computer Science Doctoral Thesis

COM 3891 Computer Science Doctoral Thesis

Continues COM 3890.



Graduate School of Criminal Justice

The following course descriptions are representative of the courses offered in the Graduate School of Criminal Justice. As it is not possible to offer all courses each year, students are urged to consult the most current announcement of course offerings for specific information regarding available courses in any given quarter. All courses described here carry three quarter-hours of credit except as noted.

CJ 3201 The Criminal Justice Process

Introduces graduate students to the operation of the criminal justice system. Covers the components of the system, the process by which defendants are moved through that system, and key issues in the administration of criminal justice.

CJ 3202 Theories of Criminology

Focuses on the use of scientific methods in the study and analysis of regularities, uniformities, patterns, and causal factors related to crime, the criminal, and social reactions to both. Analyzes critical contributions to the study of crime, criminals, and the treatment of offenders from writings in such disciplines as biology, psychology, psychiatry, endocrinology, law, sociology, and anthropology.

CJ 3203 Criminal Law

Discusses the fundamental principles and concepts of criminal law in the United States. Focuses on the relationship of the individual to the state and includes an examination of the general framework of criminal law.

CJ 3251 Criminal Justice Planning and Development

Analyzes developing public and private sector criminal justice organizational strategy and the role of planning in such processes. Studies techniques both for strategy development and planning. Considers annual budget and long-range planning. Explores elements and means of evaluating strategy and relates them to changes currently occurring in criminal justice agencies and institutions.

CJ 3252 Criminal Justice Management

Introduces skills used for implementing and managing organizational strategy in public and private sector criminal justice organizations. Focuses on organizational structure and culture, and managing personnel processes. Examines leadership and the special role it plays in establishing organizational goals, as well as developing the means required to obtain those goals. Analyzes both internal and external management skills and contrasts their relative importance in public and private sector organizations.

CJ 3253 Personnel and Labor Relations in Criminal Justice

Introduces basic skills in personnel management, selection, and placement. Develops an understanding of the social psychology of organizations concerned with law enforcement, the courts, or corrections, and familiarity with critical issues in labor relations and collective bargaining.

CJ 3254 Budget and Financing in Criminal Justice

Studies the principles and practices of budgeting in the various functional areas of criminal justice. Considers financial operations, including obtaining resources through budget development and presentation. Draws distinctions between capital budgets and expense budgets and among zero budgeting, line-item budgeting, and program budgeting. Discusses important financial concerns such as cost effectiveness, management by objectives, and critical path method (CPM). Gives special attention to budget projections as planning tools for obtaining grants, as well as a means of facilitating

needed change within the present structures of criminal justice agencies. Other topics include the utility of budgets as evaluative mechanisms is stressed, and the role of budgeting in the financial control of organizations.

CJ 3301 Administration of Private Security

Examines private security theories, operations, and practices, with special emphasis on the administration and management of security. Considers the philosophical background, history, and current role of private security are explored, as well as the role and status of the security manager in threat assessment, risk prevention, and the protection of assets. Discusses functional-area security systems, law, science and technology for security, and issues, standards, goals, and challenges for the future. Studies security systems, particularly as these "open" systems related to criminal justice and the environment. Addresses the concept of the security manager as the prime mover toward professionalization and improved management and administration of security operations, and as the advocate of contemporary organizational theories embracing research and the systems approach.

CJ 3302 Law and Private Security

Studies the legal factors that affect security operations and administration and the value of legal counsel on such factors. Discusses factors such as the pertinent aspects of torts, agency, civil rights, contracts, trade secrets, insurance, and regulatory issues.

CJ 3303 Technological Security Systems

Considers security applications of the latest scientific and technological advances and the impact of new product developments on prevention and protection, detection, and prosecution. Assignments examine the state of the art of security products and planning, implementing, maintaining, and evaluating highly sophisticated security systems.

CJ 3304 Human Factors in Security

Analyzes topics and strategies for security administration. Investigates executive development, ethical issues, stress management, conflict management, crisis management, intra-organizational relations, community agency relations, promoting security awareness, staff development, and effective security personnel and product interface are addressed.

CJ 3351 Theories of Law and Society

Introduces theories, issues, and research related to law and legal institutions, placing law in the context of social control systems, raising basic issues about the nature of law, and focusing on the relationship between law and social values. Considers the nature of law, law and social change, the sociology of the legal profession, and criminal law in action. Examines the formulation of criminal law and discrimination in the formulation and practice of criminal law.

CJ 3352 Statistical Analysis 2

Continues CJ 3204. Discusses multiple regression and its extensions, discriminant analysis, factor analysis, analysis of variance, and the analysis of contingency tables. *Prereq.* CJ 3534.

CJ 3354 Criminal Behavior Systems

Increases an understanding of particular types of crime. Examines sociological approaches to the study of particular crime types and research findings on specific criminal behavior systems. Assignments require students to explore a criminal behavior system that particularly interests them.

CJ 3505 Juvenile Law and Children's Rights

Examines the legal relationship between the juvenile offender and the state. Covers case and statutory law, as well as constitutional due-process standards in juvenile proceedings. Topics include jurisdiction, prejudicial process, waiver of jurisdiction adjudication, disposition, and postdispositional issues, as well as the right to treatment.

CJ 3508 Quantitative Models in Criminal Justice

Explores quantitative frontiers in the field of criminal justice as well as the methodological contributions of allied fields. Discusses such approaches as reliability models of recidivism, stochastic models of criminal behavior, econometric models of the criminal justice system, and deterrence models. Requires reading extensively from published and unpublished literature.

CJ 3509 Crime Measurement

Analyzes the amount, distribution, and pattern of criminal behavior in the United States via official crime statistics including the Uniform Crime Reports, victimization surveys, and self-report studies. Reviews alternative measures including indices of seriousness of various offenses. Examines historical studies of the nature and extent of criminal behavior, and discusses problems and prospects regarding accurate measures of crime and crime correlates.

CJ 3511 Theories of Delinquency

Examines critically the major theoretical explanations of juvenile delinquency. Explores theoretical approaches including social disorganization, subcultural theory, strain, control theory, labeling and conflict theory. Discusses current data on the nature and distribution of delinquency, highlighting findings from empirical research.

CJ 3512 Penology and Corrections

Focuses on the major problems and issues in the American "correctional" system today. Covers theories of punishment, types of punishment, the history of and conditions in institutions for juveniles, men, and women. Considers the crisis in overcrowding brought on by recent sentencing "reforms", among other topics.

CJ 3513 Victimology

Examines critically theories and research regarding victims of crime, giving special attention to National Crime Survey victimization data. Discusses the fear of crime, victim vulnerability, and victim culpability. Assesses the implications of victim-oriented research for the administration of justice, as well as current programs offering victim services such as restitution and compensation. Analyzes future trends in theory, research, and public policy.

CJ 3514 Police Functions in Democratic Society

Examines the sociopolitical context within which American police departments developed in the nineteenth century as well as the changing forces that shape modern departments. Considers the implications of democratic institutions and traditions for policing in America. Contrasts the organization of several different kinds of departments and examines the implications of these different types of departments for police performance. The rigors of police work, together with the social-psychological adjustments that officers at different ranks make.

CJ 3515 Women and the Criminal Justice System

Examines the roles of women in the criminal justice system. Focuses on women as offenders, as victims, and as agents of social control. Discusses women's role in both theory and practice, and on both historical and contemporary issues.

CJ 3516 Criminal Courts in America

Examines the problems, policies, and practices of the criminal court system in the United States. Addresses topics such as the structure and organization of the court system, the role that criminal courts play in United States society, and the flow of cases from arrest to conviction. Emphasizes the lower criminal court, and issues concerning court management including personnel, juries, witnesses, and scheduling are reviewed. Presents court reform initiatives.

CJ 3517 Terrorism

Divided into two sections, the first part of which examines the sociology of terrorism, including funding, intelligence gathering, weapons and tactics, informers, and countermeasures. Pays special attention to the media that report the news, yet seem often perilously close to inciting further terror. Examines the "terrorist personality," the literary depiction of terrorism, and the doctrine of systematic terrorism, as well as its current interpretations and common patterns, motives, and aims. The second part concentrates on identifying technologies of counterterrorism, discussing incident management needs, and recommending ways to lessen the risk of nationally disruptive acts. Attempts to challenge accepted assumptions and to forecast changes in terrorist activities that may affect tomorrow's headlines.

CJ 3518 Issues in Juvenile Justice

Analyzes critically the policies and practices of agencies involved in processing young people through the juvenile justice system. Considers police practices, detention, intake, diversion, adjudication, and disposition of juveniles within the justice system. Focuses on the historical development of the juvenile justice system and assesses current trends and proposals for reform.

CJ 3524 Theories of Punishment

Introduces theories and issues in punishment with a focus on topics of contemporary interest as well as the historical roots of current approaches. Considers trends and fashion in both the theory and the form of punishment. Draws reading materials from a variety of fields, including philosophy, politics, literature, law, and empirical criminal justice.

CJ 3525 Correctional Administration

Offers intensive coverage of the many problems and dilemmas that confront the correctional organization. Topics include the basic problems of correctional organization, organizational development and analysis, management by objectives, planning and budgeting systems, management style and personnel development, special problems of jails and houses of corrections, institutional programs, classifications, correctional policy, and the future of imprisonment.

CJ 3531 White Collar Crime

Examines critically the current theoretical, research, and public policy issues regarding white collar crime. The first part examines definitions of white collar crime as well as various typologies of white collar crime activity. Assesses the nature, extent and consequences of white collar crime in the United States. Discusses explanations for the commission of these offenses. The second part uses case studies to explore in more detail white collar crime. For example, cases of employee theft, corporate crime, governmental deviance, industrial espionage, and computer crime will be presented and discussed. The third part focuses on controlling white collar crime. Examines the problems of traditional criminal justice systems in controlling white collar crime and assesses the prospects of alternative systems of control—civic law, private security, public opinion.

CJ 3532 Computer Applications in Criminal Justice 4 QH

Surveys computer applications in criminal justice research and administration. Introduces both mainframe and microcomputer methods and procedures. Mainframe topics include command language and editors; file creation, storage, and access; and statistical and database software. Microcomputer topics include operating systems, database managers, spread sheets, wordprocessing, and mainframe relations.

CJ 3533 Research and Evaluation Methods 4 QH

Surveys the basic techniques of research and evaluation methods. Addresses various research strategies, including surveys, observation, archival data, experiments, and evaluation designs. Covers nontechnical, yet critical, issues such as ethical problems and the design, procedures, and politics of research, especially evaluations in criminal justice.

CJ 3534 Statistical Analysis 1 4 QH

Introduces probability and statistical analysis. Topics include measures of central tendency and dispersion; probability and the binomial, Poisson, exponential, and normal distributions; sampling distributions and hypothesis testing; and correlation, regression, and forecasting.

CJ 3535 Civil Liability and Policy Development

Addresses the various issues of civil liability and policy development in federal, state, and local criminal justice agencies and their private counterparts in corrections and security. Examines the historical development of civil rights litigation and methods of risk response utilized by criminal justice and private agencies through the case study method. Covers the nature and growth of civil liability in policing, probation, corrections, pa-

role, municipal government, private corrections, and security by reviewing legal theories and cases. Emphasizes the development of policies and procedures designed to improve services and reduce liability risks associated with agency operations.

CJ 3801, CJ 3802 Directed Study 1, 2

An independent study offers the student the opportunity to bring individual, concentrated attention to a particular topic as arranged and agreed upon in advance by a faculty member and the student. This option is generally recommended when the student desires a more intensive analysis of a particular subject. The independent study has the advantage of allowing students flexibility in learning and developing their own academic programs. *Prereq.* *Permission of graduate school director.*

CJ 3803, CJ 3804 Internship 1, 2

Field instruction in a criminal justice agency where instruction may be offered through administrative, research, teaching and/or related activities. Students have the opportunity to apply theoretical concepts in a practical, applied fashion by observing and contributing to the daily activities of operating agencies and organizations. *Prereq.* *Permission of graduate school director.*

CJ 3805 Master's Thesis**6 QH**

Students electing to write a master's thesis must select a thesis topic with the advice of a faculty member and receive approval of the thesis topic from the graduate director. *Prereq.* *Permission of graduate school director.*

CJ 3806 Field Practicum Seminar

Offers a setting in which field practicum experiences can be discussed and analyzed as they relate to planning and management principles. By virtue of the field placement, the student may experience the routine activities of a public agency/organization. The seminar gives an opportunity to integrate the practical experience with the theoretical concepts. *Prereq.* *Permission of instructor.*

Graduate School of Engineering

Chemical Engineering

Each course description includes information on the quarter in which classes are usually offered. The quarters listed are presented for planning; however, the Graduate School of Engineering cannot guarantee that all courses will be offered. Students must refer to the Graduate School of Engineering Quarterly Course Offering sheets to determine what courses are actually offered in any given quarter.

CHE 3300 Chemical Engineering Mathematics 4 QH Fall Quarter, Alternating Years

Presents formulation and solution of problems involving advanced calculus as they arise in chemical engineering situations. Considers such methods as ordinary differential equations, series solutions, complex variables, Laplace transforms, partial differential equations, and matrix operations. Emphasizes methods for formulating the problems. Assumes that students have studied some of these topics in appropriate mathematics courses. *Prereq. BS degree in chemical engineering, including mathematical analysis.*

CHE 3301 Chemical Engineering Mathematics 2 QH Fall Quarter, As Announced

CHE 3301 and CHE 3302 cover the same material with the same prerequisites as CHE 3300, but in two 2 QH courses.

CHE 3302 Chemical Engineering Mathematics 2 2 QH Winter Quarter

Continues CHE 3301. *Prereq. CHE 3301.*

CHE 3310 Chemical Engineering Thermodynamics 4 QH 1 Winter Quarter, Alternating Years

Considers classical thermodynamics as a method of approach to the analysis of processes of interest to chemical engineers. Studies phase equilibria involving the various states of matter; predation and correlation of physical, chemical, and transport properties of gases and liquids; and elementary concepts of quantum and statistical mechanics to interpret the empirical properties of classical thermodynamics. Reviews fundamental principles. *Prereq. BS degree in chemical engineering.*

CHE 3311 Chemical Engineering Thermodynamics 1 2 QH Winter Quarter, as Announced

CHE 3311 and CHE 3312 cover the same material with the same prerequisites as CHE 3301, but in two 2 QH courses.

CHE 3312 Chemical Engineering Thermodynamics 2 2 QH Spring Quarter, As Announced

Continues CHE 3311. *Prereq. CHE 3311.*

CHE 3320 Separation Process 4 QH Spring Quarter, Alternating Years

Explores the calculation and design methods used in processes in-involving mass transfer. Topics include vapor liquid equilibria for binary and multicomponent systems, multicomponent distillation, absorption, and extraction. Emphasizes methods and techniques that are common to many separation processes. *Prereq. BS degree in chemical engineering.*

CHE 3321 Separation Processes 1 2 QH Winter Quarter, As Announced

CHE 3321 and CHE 3322 cover the same material with the same prerequisites as CHE 3320, but in two 2 QH courses.

CHE 3322 Separation Processes 2 2 QH Spring Quarter, As Announced

Continues CHE 3321. *Prereq. CHE 3321.*

CHE 3330 Chemical Process Control 4 QH Fall Quarter, Alternating Years

Reviews classical control techniques; state variable representation and analysis of continuous control systems in chemical engineering, including controllability, observability, and stability. Includes multivariable control problems in chemical engineering, an introduction to optimal control, and digital simulation included when appropriate. *Prereq. Graduate standing in chemical engineering.*

CHE 3331 Chemical Process Control 1 2 QH Fall Quarter, As Announced

CHE 3331 and CHE 3332 cover the same material with the same prerequisites as CHE 3330, but in two 2 QH courses.

CHE 3332 Chemical Process Control 2 2 QH Winter Quarter

Continues CHE 3331. *Prereq. CHE 3331.*

CHE 3340 Heterogeneous Catalysis 4 QH Winter Quarter, Alternating Years

Studies the experimental methods required for determining the surface area and pore structure of catalyst carriers. Explores the use of these structural characteristics to estimate mass and heat transport rates within porous catalyst in order to determine their effectiveness with respect to chemical reaction. Analyzes mechanisms for chemical poisoning of catalysts, and considers reactions of practical interest used to illustrate the applications of heterogeneous catalysis to modern chemical processing problems. *Prereq. BS degree in chemical engineering.*

CHE 3341 Heterogeneous Catalysis 1 2 QH CHE 3341 and CHE 3342 cover the same material with the same prerequisites as CHE 3340, but in two 2 QH courses.

CHE 3342 Heterogeneous Catalysis 2 2 QH Spring Quarter, As Announced

Continues CHE 3341. *Prereq. CHE 3341.*

CHE 3350 Chemical Process Heat Transfer 4 QH
Spring Quarter, Alternating Years
 Presents empirical methods and calculations used to design heat transfer equipment for the chemical process industries. Reviews basic heat transfer principles, and studies shell-and-tube calculations for liquid and/or vapor phase heat transfer, direct contact, and other special heat exchanger applications. *Prereq.* BS degree in chemical engineering.

CHE 3351 Chemical Process Heat Transfer 1 2 QH
Winter Quarter, As Announced
 CHE 3351 and CHE 3352 cover the same material with the same prerequisites as CHE 3350, but in two 2 QH courses.

CHE 3352 Chemical Process Heat Transfer 2 2 QH
Spring Quarter, As Announced
 Continues CHE 3351. *Prereq.* CHE 3351.

CHE 3400 Advanced Chemical Engineering 4 QH
Calculations
As Announced
 Offers the fundamental process principles leading to an understanding of the stoichiometric principles of chemical process plants. Studies complex material and energy balances with the view to applying these principles to actual large chemical plant conditions. *Prereq.* BS degree in chemical engineering, including differential equations.

CHE 3401 Advanced Chemical Engineering 2 QH
Calculations 1
As Announced
 CHE 3401 and CHE 3402 cover the same material with the same prerequisites as CHE 3400, but in two 2 QH courses.

CHE 3402 Advanced Chemical Engineering 2 QH
Calculations 2
As Announced
 Continues CHE 3401. *Prereq.* CHE 3401.

CHE 3410 Numerical Techniques in Chemical 4 QH
Engineering
Fall Quarter, As Announced
 Examines digital computer applications to chemical engineering problems. Topics include location of roots of linear and nonlinear equations, numerical integration, and curve-fitting techniques with emphasis on the numerical solution of ordinary and partial differential equations and to the subject of linear algebra. *Prereq.* BS degree in chemical engineering.

CHE 3411 Numerical Techniques in Chemical 2 QH
Engineering 1
Fall Quarter, As Announced
 CHE 3411 and CHE 3412 cover the same material with the same prerequisites as CHE 3410, but in two 2 QH courses.

CHE 3412 Numerical Techniques in Chemical 2 QH
Engineering 2
Winter Quarter, As Announced
 Continues CHE 3411. *Prereq.* CHE 3411.

CHE 3430 Chemical Data Estimation 4 QH
As Announced
 Explores methods of obtaining physical and thermodynamic properties of chemical compounds and systems without resorting to laboratory investigation. Introduces latest empirical relationships and physical and thermodynamics laws to obtain data for plant design and other chemical and engineering uses. *Prereq.* BS degree.

CHE 3431 Chemical Data Estimation 1 2 QH
Fall Quarter, As Announced
 CHE 3431 and CHE 3432 cover the same material with the same prerequisites as CHE 3430, but in two 2 QH courses.

CHE 3432 Chemical Data Estimation 2 2 QH
Winter Quarter, As Announced
 Continues CHE 3431. *Prereq.* CHE 3431.

CHE 3450 Analytical and Numerical Techniques 4 QH
As Announced
 For students interested in solving comprehensive problems using computer methods. Problems solved in the course will be based on the interest of the students and staff and will be individual. *Prereq.* BS degree and knowledge of digital computer programming.

CHE 3500 Transport Phenomena 4 QH
Winter Quarter, As Announced
 Presents and solves momentum rate conservation equations for steady-state fluid flow in two-dimensional boundary layers to obtain the fluid velocity profiles. Uses the solutions to consider heat and mass transfer phenomena at a fluid-solid interface. Applies the development of surface renewal theory to the description of heat and mass transfer phenomena. *Prereq.* BS degree in chemical engineering.

CHE 3501 Transport Phenomena 1 2 QH
Winter Quarter, As Announced
 CHE 3501 and CHE 3502 cover the same material with the same prerequisites as CHE 3500, but in two 2 QH courses.

CHE 3502 Transport Phenomena 2 2 QH
Spring Quarter, As Announced
 Continues CHE 3501. *Prereq.* CHE 3501.

CHE 3510 Modeling and Simulation of Chemical 4 QH
Processes
Winter Quarter, Alternating Years
 Explores the use of special purpose and general purpose computer programs in solving the steady-state material and energy balances of chemical processes. Discusses related background material that may be applied to these computer programs such as convergence acceleration for calculations involving recycle streams, tearing recycle streams for iteration on minimum number of streams and minimum number of parameters, and algorithms for design variable selection. *Prereq.* Graduate standing in chemical engineering.

CHE 3511 Modeling and Simulation of Chemical Processes 1 2 QH

Winter Quarter, As Announced

CHE 3511 and CHE 3512 cover the same material with the same prerequisites as CHE 3510, but in two 2 QH courses.

CHE 3512 Modeling and Simulation of Chemical Processes 2 2 QH

Spring Quarter, As Announced

Continues CHE 3511. *Prereq. CHE 3511.***CHE 3520 Computer Process Control 4 QH**

Winter Quarter, Alternating Years

Studies computer control hardware and software. Examines Z-transform, pulse transfer functions, and data holds. Topics include open and closed-loop response and design of sampled-data systems, computer control algorithms, and digital simulation of sampled data systems. *Prereq. Graduate standing in chemical engineering.*

CHE 3521 Computer Process Control 1 2 QH

Winter Quarter, As Announced

CHE 3521 and CHE 3522 cover the same material with the same prerequisites as CHE 3520, but in two 2 QH courses.

CHE 3522 Computer Process Control 2 2 QH

Spring Quarter, As Announced

Continues CHE 3521. *Prereq. CHE 3521.***CHE 3530 Advanced Management Techniques in the Chemical Industry 4 QH**

Fall Quarter

Focuses on management techniques applied to the chemical industry. Pays special attention to management of research organizations and to management of engineering services, such as design, computer, and related activities. *Prereq. Graduate standing.*

CHE 3531 Advanced Management Techniques in the Chemical Industry 1 2 QH

Fall Quarter, As Announced

CHE 3531 and CHE 3532 cover the same material with the same prerequisites as CHE 3530, but in two 2 QH courses.

CHE 3532 Advanced Management Techniques in the Chemical Industry 2 2 QH

Winter Quarter, As Announced

Continues CHE 3531. *Prereq. CHE 3531.***CHE 3540 Advanced Process Design Concepts 4 QH**

Spring Quarter

Stresses techniques and approaches used in the development of new or improved processes. Topics include establishment of process bases, use of process simulators in design, optimization and evaluation of alternatives, and preliminary equipment design and cost estimating techniques. *Prereq. BS degree in chemical engineering.*

CHE 3541 Advanced Process Design Concepts 1 2 QH

Fall Quarter, As Announced

CHE 3541 and CHE 3542 cover the same material with the same prerequisites as CHE 3540, but in two 2 QH courses.

CHE 3542 Advanced Process Design Concepts 2 2 QH

Winter Quarter, As Announced

Continues CHE 3541. *Prereq. CHE 3541.***CHE 3543 Advanced Plant Design Concepts 2 QH**

Spring Quarter, As Announced

Studies modern approaches to plant design: computer-oriented design, analysis and simulation of chemical processes, use of strategy decision making in design, advanced scheduling and planning techniques. *Prereq. BS degree in chemical engineering.*

CHE 3560 Fluid Mechanics 4 QH

Fall Quarter, Alternating Years

Discusses statics, kinematics, and stress concepts associated with fluids. Considers formation of the general equations of motion with application to laminar and turbulent flow. Topics include boundary layer theory and compressible flow. *Prereq. BS degree in chemical engineering.*

CHE 3561 Fluid Mechanics 1 2 QH

Fall Quarter, As Announced

CHE 3561 and CHE 3562 cover the same material with the same prerequisites as CHE 3560, but in two 2 QH courses.

CHE 3562 Fluid Mechanics 2 2 QH

Winter Quarter, As Announced

Continues CHE 3561. *Prereq. CHE 3561.***CHE 3600 Polymer Science 4 QH**

Fall Quarter

Studies the basic concepts of polymers, thermodynamics of polymer solutions and measurement of molecular weight. Examines the physical and chemical properties and testing of polymers. Investigates the crystallinity in polymers and rheology of polymers. Considers mechanisms and conditions for polymerization of polymers including step-reaction, addition, and copolymerization. Discusses carbon-chain polymers, fibers, and fiber technology. *Prereq. BS degree in chemical engineering or chemistry.*

CHE 3601 Polymer Science 1 2 QH

Fall Quarter, As Announced

CHE 3601 and CHE 3602 cover the same material with the same prerequisites as CHE 3600, but in two 2 QH courses.

CHE 3602 Polymer Science 2 2 QH

Winter Quarter

Continues CHE 3601. *Prereq. CHE 3601.***CHE 3620 Principles of Polymerization 4 QH**

Fall Quarter

Introduces polymers and polymer properties, focusing on mechanisms of polymerization including step polymerization, radical-chain polymerization, emulsion polymerization, ionic-chain polymerization, chain copolymerization, and ring-opening polymerization. Examines the stereo chemistry of polymerization and synthetic reactions of polymers, and studies applications to reactor design of industrially important polymers. *Prereq. Graduate standing in chemical engineering.*

CHE 3621 Principles of Polymerization 1 2 QH
Fall Quarter

CHE 3621 and CHE 3622 cover the same material with the same prerequisites as CHE 3620, but in two 2 QH courses.

CHE 3622 Principles of Polymerization 2 2 QH
Winter Quarter, As Announced

Continues CHE 3621. *Prereq.* CHE 3621.

CHE 3630 Chemical Process Pollution Control 4 QH
Spring Quarter, Alternating Years

Provides chemical engineering students with the fundamentals for handling environmental problems in the chemical process industries. Studies water quality requirements and industrial waste characteristics, wastewater treatment processes applicable to environmental engineering, and biological treatment processes and equipment. Discusses comprehensive design problems involving biological and tertiary treatment, and the economics of water treatment and reuse. *Prereq.* Graduate standing in chemical engineering.

CHE 3631 Chemical Process Pollution Control 1 2 QH
Winter Quarter

CHE 3631 and CHE 3632 cover the same material with the same prerequisites as CHE 3630, but in two 2 QH courses.

CHE 3632 Chemical Process Pollution Control 2 2 QH
Spring Quarter

Continues CHE 3631. *Prereq.* CHE 3631.

CHE 3659 Solar Energy Thermal Processes 2 QH
Fall Quarter

Covers fundamental thermal processes involved in obtaining useful heat from flat-plate solar collectors. Analyzes the components required in an active solar energy collection system and considers the economics of the system. *Prereq.* BS degree.

CHE 3663 Fundamentals of Polymer Processing 4 QH
Winter Quarter

Presents the transport properties of polymer solutions and polymer melts. Discusses modeling and design of polymer processing equipment, as well as flow models for processes involving heat, mass, and/or momentum transfer. Topics include the analysis flow stability and elastic phenomena, and applications to the design of equipment for extrusion, calendaring, coating, fiber spinning, tular film blowing, injection molding and mixing. *Prereq.* Graduate standing in chemical engineering.

CHE 3664 Fundamentals of Polymer Processing 1 2 QH
Winter Quarter

CHE 3664 and CHE 3665 cover the same material with the same prerequisites as CHE 3663, but in two 2 QH courses.

CHE 3665 Fundamentals of Polymer Processing 2 2 QH
Spring Quarter

Continues CHE 3664. *Prereq.* CHE 3664.

CHE 3670 Special Topics in Chemical Engineering 4 QH
As Announced

Topics of interest to the staff member conducting this class are presented for advanced study. A student may not take more than one special topics course with any one instructor. *Prereq.* Permission of department staff.

CHE 3671 Kinetics of Chemical Processes 4 QH
Spring Quarter, Alternating Years

Presents the theoretical foundations for the analysis of elementary chemical reaction rates, such as collision theory, particle dynamics, and transition state theory. Considers the theory of monomolecular reactions and the effect of solvent and electrostatic forces on liquid phase reaction rates. Covers homogeneous catalysis and selected free-energy correlations. *Prereq.* BS degree in chemical engineering.

CHE 3672 Kinetics of Chemical Processes 1 2 QH
Winter Quarter

CHE 3672 and CHE 3673 cover the same material with the same prerequisites as CHE 3671, but in two 2 QH courses.

CHE 3673 Kinetics of Chemical Process 2 2 QH
Spring Quarter, As Announced

Continues CHE 3672. *Prereq.* CHE 3672.

CHE 3680 Corrosion Fundamentals 2 QH
As Announced

Studies economic factors, basic theories, types, behaviors of specific systems, and protection against corrosion. Wherever possible, engineering applications of the principles are emphasized. *Prereq.* BS degree.

CHE 3691 Seminar 2 QH
Any Quarter

Offers advanced topics presented by staff, outside speakers, and students in the graduate program. This course must be attended by all master's degree candidates. *Prereq.* Graduate standing in chemical engineering.

CHE 3701 Special Topics in Chemical Engineering 1 2 QH
Any Quarter

Offers advanced topics presented by a staff member. A student may take this course and its continuation in CHE 3702 with the same instructor.

CHE 3702 Special Topics in Chemical Engineering 2 2 QH
Any Quarter

Continues CHE 3701.

CHE 3796 Doctoral Thesis Continuation 0 QH
Any Quarter**CHE 3798 Master's Thesis Continuation 0 QH**
Any Quarter**CHE 3799 Doctoral Thesis Continuation 0 QH**
Any Quarter

CHE 3860 Master's Thesis	10 QH
Any Quarter	
Analytical and/or experimental work conducted under the supervision of the department. Ten QH maximum credit for thesis. Students normally register in CHE 3861 or CHE 3862. <i>Prereq.</i> Graduate standing in chemical engineering.	
CHE 3861 Master's Thesis	4 QH
Any Quarter	
CHE 3862 Master's Thesis	2 QH
Any Quarter	

CHE 3880 Doctoral Thesis	0 QH
Any Quarter	
Theoretical and experimental work conducted under the supervision of the department. <i>Prereq.</i> Admission to doctoral program in chemical engineering.	
CHE 3885 Doctoral Thesis	0 QH
Any Quarter	
Theoretical and experimental work conducted under the supervision of the department. <i>Prereq.</i> Admission to program in chemical engineering.	

Civil Engineering

Each course description includes information on the quarter in which classes are usually offered. The quarters listed are presented for planning; however, the Graduate School of Engineering cannot guarantee that all courses will be offered. Students must refer to the Graduate School of Engineering Quarterly Course Offering sheets to determine what courses are actually offered in any given quarter.

CIV 3131 Engineering Statistics 1 2 QH Fall Quarter

Introduces the basic elements of probability theory and statistics and their use via the solution of various civil engineering problems encountered in fluid mechanics, construction management, structures, transportation. Discusses the probability of events, random variables and distributions, derived distributions, expectation, and common probability models. *Prereq.* Undergraduate calculus.

CIV 3132 Engineering Statistics 2 2 QH Winter Quarter

Continues CIV 3131. Includes parameter estimation, confidence intervals, hypothesis testing, and linear statistical models. *Prereq.* CIV 3131.

CIV 3134 Decision Analysis in Civil Engineering 2 QH Spring Quarter

Studies the basic theory of decision-making under uncertainty, applied to design and managerial problems in civil engineering, feasibility analysis and construction (for example reservoir capacity design, dam safety options, to build or not to build a drainage system, flood levee design, economic analysis of construction projects, value engineering, construction method selection in tunneling). Covers decision trees, value of perfect information, value of sample information, multi-criteria decision making, and multi-attribute utility theory. *Prereq.* CIV 3131.

CIV 3136 Performance and Safety Evaluation in Civil Engineering 2 QH Spring Quarter

Focuses on the application of reliability to the design and analysis of civil engineering facilities. Discusses the reliability of redundant systems such as indeterminate structure. Examines statistical distributions of system parameters (for example, component strengths, flow rates, soil strengths) and demands (for example

seismic loading, traffic volumes). Topics include safety indices, load factors, reliability based design codes, and damage evaluation and reliability prediction of civil engineering facilities. *Prereq.* CIV 3131.

CIV 3141 Numerical Methods in Civil Engineering 1 2 QH Fall Quarter, Alternate Years

Discusses errors in numerical analysis, solution of nonlinear algebraic equations by direct and iterative methods, and introduction to matrix eigenvalue problems. Examples are drawn from structural mechanics. *Prereq.* Admission to Graduate School of Engineering.

CIV 3142 Numerical Methods in Civil Engineering 2 2 QH Winter Quarter, Alternate Years

Continues CIV 3141. Presents the approximation of functions: interpolation, and least squares curve fitting, and orthogonal polynomials. Covers numerical differentiation and integration; solution of ordinary and partial differential equations, and integral equations; and discrete methods of solution of initial and boundary-value problems. Examples are drawn from structural mechanics, geotechnical engineering, hydrology, and hydraulics. *Prereq.* CIV 3141.

CIV 3161 Systems Analysis 1 2 QH Fall Quarter

Applies linear optimization models to various civil engineering problems: the simplex method, sensitivity analysis, transportation problem, transshipment problem, and shortest path problem. *Prereq.* Admission to Graduate School of Engineering.

CIV 3162 Systems Analysis 2 2 QH Winter Quarter

Applies systems analysis techniques to civil engineering problems: dynamic programming, linear regression, model estimation, queuing theory, and project evaluation. *Prereq.* CIV 3131 and CIV 3161; taken concurrently with CIV 3132.

CIV 3171 Seminar in Public Works 1**2 QH****Winter Quarter**

Discusses the history and role of public works in development, including historical development, economic, and financial dimensions of public works in city and state government, technological change, local, regional, and national planning. Considers public works capital development, including political, economic, financial, social, administrative, and technical factors. *Prereq. Admission to Graduate School of Engineering.*

CIV 3172 Seminar in Public Works 2**2 QH****Spring Quarter**

Studies public works applications in management science, including such topics as applications of benefit/cost, cost-effectiveness, allocation, models, decision theory, queuing theory, and simulation. Discusses maintenance management including inventory, performance standards, scheduling, budgets and finance. Examines the public works planning issues of environmental assessment, techniques of land use planning and procedures, facility location, and resource utilization. *Prereq. CIV 3171.*

CIV 3231 Construction Management 1**2 QH****Fall Quarter**

Examines cost estimating, including a description of computerized cost estimating systems and duration estimating, considering work analysis techniques. Topics include value engineering as a concept and its effect on the construction industry, and specifications, including the use and importance of computerized Specification Writing Systems. *Prereq. Admission to Graduate School of Engineering.*

CIV 3232 Construction Management 2**2 QH****Winter Quarter**

Considers the application of scheduling methods to the control of construction activities, including resource allocation, quality control, cash flow progress reporting, and the effects of change orders. *Prereq. CIV 3231.*

CIV 3237 Construction Methods and Equipment 1**2 QH****Fall Quarter**

Discusses typical approaches to construction in a selection of application areas such as steel and concrete structures, hydraulic and port facilities, horizontal construction and the like. *Prereq. Admission to Graduate School of Engineering.*

CIV 3238 Construction Methods and Equipment 2**2 QH****Winter Quarter**

Continues CIV 3237, treating additional areas of construction. *Prereq. CIV 3237.*

CIV 3241 Legal Aspects of Civil Engineering**2 QH****Fall Quarter**

Presents United States and international legal systems and theories necessary for the comprehension of business and contractual liabilities, rights and obligations in the engineering field. *Prereq. Admission to Graduate School of Engineering.*

CIV 3242 Legal Aspects of Civil Engineering 2**2 QH****Winter Quarter**

Offers a description and evaluation of various types of construction contracts, procedures and formats for submitting bids, filing claims, and legal steps to avoid liabilities, utilizing the principles learned in CIV 3241. *Prereq. CIV 3241.*

CIV 3245 Construction Seminar**2 QH****Spring Quarter**

Focuses on reading and discussing recent research publications in construction engineering. *Prereq. Limited to Construction Management Program majors; taking in final spring quarter.*

CIV 3250 Project Evaluation and Financing**2 QH****Fall Quarter**

Reviews project evaluation techniques, as applied to construction and infrastructure projects. Studies bond pricing mortgage analysis, construction loan analysis in the development process, and valuation of income-producing properties. Considers project financing packages in the areas of real property and infrastructure. Examines the impact of financing on project value, and Capital Budgeting Models and their applications to infrastructure planning. *Prereq. Concurrent with ACC 3811.*

CIV 3252 Construction Project Control and**2 QH****Organization****Winter Quarter**

Discusses the organization of construction firms, both at the general corporate level and at the project level. Considers organization dynamics designed to respond to the requirements of the environment given the internal constraints of the firm. Introduces computer systems for the control of construction projects, emphasizing design attributes to fit the needs of the organization and the end users. Explores the estimating, scheduling, budgeting, and financial control of projects. Topics include network-based systems for planning and time control, intra-project and inter-project resource allocation, and database design concepts for decision support systems. *Prereq. CIV 3161.*

CIV 3310 Environmental Chemistry 1**2 QH****Fall Quarter**

Reviews basic chemistry and discusses the equilibrium chemistry of homogeneous and heterogeneous systems with applications in environmental engineering. Studies the physical and chemical properties of water, as well as acidity, alkalinity, hardness, and water softening. Topics include receiving water quality and disinfection. *Prereq. Two quarters of general chemistry.*

CIV 3311 Environmental Chemistry 2**2 QH****Winter Quarter**

Continues CIV 3310, including the basic principles of new chemical thermodynamics, electrochemistry, kinetics, organic chemistry, biochemistry, and nuclear chemistry as they relate to environmental engineering. Discusses colloidal chemistry and coagulation, and fundamental water quality parameters such as BOD, COD, and TOC. *Prereq. CIV 3310; taken concurrently with CIV 3325.*

- CIV 3312 Environmental Chemistry 1, 2** 4 QH
Fall Quarter
Embodies the material in CIV 3310 and CIV 3311.
Prereq. Two quarters of general chemistry.
- CIV 3315 Water and Wastewater Treatment 1** 2 QH
Fall Quarter
Examines design principles and theory for pretreatment, sedimentation, coagulation, flocculation, chemical softening, filtration, activated carbon absorption, and disinfection. *Prereq.* Undergraduate fluid mechanics courses.
- CIV 3316 Water and Wastewater Treatment 2** 2 QH
Winter Quarter
Continues CIV 3315, including design principles involved in various biological treatment systems, oxygen transfer systems, solids thickening, aerobic digestion, and anaerobic treatment systems. *Prereq.* CIV 3315 and CIV 3323.
- CIV 3317 Advanced Wastewater Treatment 3** 2 QH
Spring Quarter
Explores operational and design principles involved in sludge dewatering, biological nitrification and denitrification, phosphorus removal, and other advanced treatment methods. *Prereq.* CIV 3316.
- CIV 3318 Water and Wastewater Treatment 1 and 2** 4 QH
Fall Quarter
Embodies the material in CIV 3315 and CIV 3316.
Prereq. Undergraduate fluid mechanics.
- CIV 3321 Environmental Biological Processes** 4 QH
Winter Quarter
Embodies the material in CIV 3322 and CIV 3323.
Prereq. CIV 3311.
- CIV 3322 Environmental Biological Processes 1** 2 QH
Winter Quarter
Discusses microbiology with emphasis on biological processes of importance in environmental engineering applications. Topics include cell structure, cell nutrition, morphology, microbial metabolism and kinetics as applied to biological treatment processes. *Prereq.* CIV 3310. May be taken concurrently with CIV 3311.
- CIV 3323 Environmental Biological Processes 2** 2 QH
Spring Quarter
Continues CIV 3322. Topics include biological wastewater treatment processes, eutrophication theory, disinfection theory, and the effects of toxins on microorganisms. *Prereq.* CIV 3322.
- CIV 3325 Environmental Chemistry Laboratory** 2 QH
Winter Quarter
Emphasizes analysis related to important topic areas in environmental chemistry. Topics include alkalinity, hardness, acid-base reactions, chemical kinetics, precipitation reactions, and chlorine and oxidation-reduction reactions. *Prereq.* CIV 3310. May be taken concurrently with CIV 3311.

- CIV 3326 Biological Processes Laboratory** 2 QH
Spring Quarter
Focuses on analysis related to microbiological examination and other wastewater treatment parameters used to monitor the biological process such as: BOD, TOC, COD, gravimetric methods, and dissolved oxygen. *Prereq.* CIV 3325.
- CIV 3327 Environmental Analysis 1 and 2** 4 QH
Fall Quarter
Embodies the material in CIV 3325 and CIV 3326.
Prereq. Taken concurrently with CIV 3312.
- CIV 3331 Environmental Computer Applications 1** 2 QH
Fall and Winter Quarters
Employs computers to handle environmental engineering data. Topics include statistics, curve fitting correlation, linear regression, spreadsheet data handling, BOD kinetics, and chemical reaction interactions. *Prereq.* Admission to Graduate School of Engineering and familiarity with FORTRAN or BASIC.
- CIV 3332 Environmental Computer Applications 2** 2 QH
Spring Quarter
Continues CIV 3331. Studies the application of computer modeling and data base management systems to specific environmental problems and processes including reactor kinetics, stream and lake modeling, treatment plant performance modeling, and stormwater management. *Prereq.* CIV 3331.
- CIV 3341 Industrial Waste Disposal** 2 QH
Spring Quarter
Evaluates industrial waste problems and development of process design for the required treatment facilities, and studies various manufacturing processes and their wastewater problems. Examines industrial waste survey techniques, characteristics of industrial wastes, and evaluation of hazardous materials, waste reduction methods. Considers the physical, chemical, biological, and advanced treatment methods, as well as industrial wastewaters and disposal and treatment of industrial solids and liquids. *Prereq.* CIV 3311 and CIV 3317.
- CIV 3343 Process Laboratory in Environmental Engineering 1** 2 QH
Winter Quarter
Laboratory scale unit operations illustrating the physical, chemical, and biological principles involved in water and wastewater treatment. The aim is to obtain criteria for system design. Topics include disinfection, water softening, sedimentation, chemical coagulation, and ion exchange. *Prereq.* CIV 3317 and CIV 3326.
- CIV 3344 Process Laboratory in Environmental Engineering 2** 2 QH
Spring Quarter
Continues CIV 3343. Topics include biodegradability studies using activated sludge, fixed-film reactors, anaerobic digestion, vacuum filtration, and chemical-physical processes involved in wastewater treatment. A comprehensive evaluation of each unit process is required in a report from each student. *Prereq.* CIV 3343.

CIV 3348 Stream Sanitation 2 QH
Winter Quarter
 Analyzes the fate and effects of discharge of conservative and nonconservative pollutants in surface receiving waters and groundwaters. Topics include BOD and oxygen and relationships in streams, eutrophication and general water quality improvement techniques. *Prereq.* CIV 3310.

CIV 3352 Open Channel Flow 2 2 QH
Fall Quarter, Alternate Years
 Studies rapidly varied flow, hydraulic jump and its applications, and flow through nonprismatic channel sections. Topics include flow in channels of nonlinear alignment, wave action, unsteady flow, dynamic equations, wave propagation, and flood routing in rivers.

CIV 3355 Hydrology 1 2 QH
Winter Quarter, Alternate Years
 Discusses the elements of the hydrologic cycle, precipitation, evaporation, streamflow, and groundwater. Considers water balance equation for watersheds, streamflow hydrographs, unit hydrographs, and hydrographs of overland flow. Covers the relation between precipitation and runoff, hydrologic and hydraulic routings, and linear reservoirs routing. *Prereq.* CIV 3131 and undergraduate fluid mechanics and hydraulic engineering.

CIV 3356 Hydrology 2 2 QH
Spring Quarter, Alternate Years
 Investigates deterministic hydrologic models, probability in hydrology, and stochastic hydrology, generation of data, Markov chain series. Topics include flood forecasting, applications of hydrology, and design considerations. *Prereq.* CIV 3132 and CIV 3355.

CIV 3358 Flow Through Porous Media 2 QH
Fall Quarter, Alternate Years
 Examines groundwater uses, properties of porous media, infiltration, saturated and unsaturated zones, soil water interactions, and types of aquifers. Focuses on Darcy's law, Dupuit-Forchheimer's assumption, groundwater flow equations, steady and unsteady cases, and steady state seepage problems, including method of flow nets. Discusses dispersion, quality, and contamination of groundwater. *Prereq.* Undergraduate fluid mechanics and hydraulic engineering.

CIV 3360 Groundwater and Seepage 2 QH
Winter Quarter, Alternate Years
 Studies hydraulics of wells, steady and transient flow equations, pumping tests, multiple well systems, and methods of images. Considers superposition, leaky aquifers, salt-water intrusion, static equilibrium and hydrodynamic equilibrium, and control of saline water intrusion. Topics include numerical and experimental methods, physical models, analog models, finite difference solution, and an introduction to the method of finite elements. *Prereq.* CIV 3358.

CIV 3367 Water Resources Planning 2 QH
Spring Quarter, Alternate Years
 Examines the nature of water resources projects (sociopolitical, legal), the objectives of water resources

planning (economic, cost, benefit), and problems in water resources engineering (development, design, operational, recapitulation). Introduces linear and dynamic programming, simulation methods, and includes case studies. *Prereq.* CIV 3355.

CIV 3370 Air Pollution Engineering 2 QH
Winter Quarter
 Investigates the theory and practice related to engineering management of air resources. Studies applications of models for the atmospheric dispersion of pollutants, and analyzes control systems for gaseous and particulate emissions utilizing dry collection, wet collection, absorption, and catalytic processes. Discusses source control evaluation and air quality standards. Course CIV 3374 is recommended. *Prereq.* Admission to Graduate School of Engineering.

CIV 3372 Air Sampling and Analysis 2 QH
Spring Quarter, Alternate Years
 Discusses the basic design considerations and requirements for air quality surveillance. Examines the methodologies for air quality sampling, sampling frequencies, measurement techniques and data acquisition, handling, and analysis. Discusses manual and automated techniques for evaluating source and ambient systems. Employs statistical techniques to evaluate air quality management strategies. *Prereq.* CIV 3370.

CIV 3374 Air Pollution Science 2 QH
Fall Quarter
 Explores the biological and chemical aspects of air pollution, emphasizing the toxicological aspects of the environment, physiological effects of aerosols, analysis of organic and inorganic constituents of the atmosphere and rationale for establishment of air quality criteria and standards. *Open to nonengineering as well as to engineering graduate students. Prereq.* Permission of department and instructor.

CIV 3376 Industrial Hygiene 2 QH
Winter Quarter
 Studies the characterization and control of industrial problems associated with noise, heat and ventilation. Discusses the physical and biological aspects of environmental stress. Emphasizes the application of engineering principles to the design of control systems. Reviews evaluation procedures for control effectiveness. *Prereq.* Admission to Graduate School of Engineering.

CIV 3378 Environmental Planning and Management 2 QH
Fall Quarter
 Examines the planning and operation, and management of specific environmental systems, such as collection systems. Topics include solids separators, combined systems control, sewer flushing, deposition loadings with least-squared applications, and case studies in optimal design of treatment plants with variable input. *Prereq.* Admission to Graduate School of Engineering.

CIV 3380 Environmental Protection 2 QH
Spring Quarter, Alternate Years
 Considers environmental quality and its effects on health, comfort, aesthetics, balance of ecosystems, and

renewable resources. Discusses the interaction of the water-land-air complex, vector control, food protection, ionizing radiation, other radiation, and the energies of heat and sound. *Prereq. Admission to Graduate School of Engineering.*

CIV 3384 Solid Waste Management 2 QH
Fall Quarter

Presents basic solid waste management for engineering and science students covering storage, collection practices, sanitary landfill principles, incineration practices, and reclamation possibilities. *Prereq. Admission to Graduate School of Engineering.*

CIV 3386 Hazardous Waste Practices 2 QH
Spring Quarter

Investigates hazardous waste management practices including: identification, storage, transport, treatment processes, incineration, recycling, reuse, chemical landfills, and groundwater contamination. *Prereq. CIV 3311 or 3312.*

CIV 3410 Soil Mechanics 1 2 QH
Fall Quarter

Studies phase relationships and index properties, permeability, capillarity, effective stress concept, porous media flow, stress distribution, stress path concept, and 1-D settlement analysis. *Prereq. Undergraduate course in soil mechanics.*

CIV 3411 Soil Mechanics 2 2 QH
Winter Quarter

Continues CIV 3410. Examines consolidation theory, 3-D settlement analysis, shear strength properties of soils, and stress path analysis. *Prereq. CIV 3410.*

CIV 3412 Stability and Seepage 2 QH
Spring Quarter

Continues CIV 3411. Reviews stability of open cuts and natural slopes, numerical analysis and computer applications to stability, seepage, consolidation, and deformation problems. Presents lab testing, field instrumentation, and special topics. *Prereq. CIV 3411 or CIV 3413.*

CIV 3413 Soil Mechanics 1, 2 4 QH
Fall Quarter

Embodies the material in CIV 3410 and CIV 3411. *Prereq. Undergraduate course in soil mechanics.*

CIV 3420 Foundation Engineering 1 2 QH
Fall Quarter, Alternate Years

Studies lateral earth pressure theory, retaining wall design, anchored bulkheads, braced cofferdams, dewatering, and observational approach to design. *Prereq. CIV 3411.*

CIV 3421 Foundation Engineering 2 2 QH
Winter Quarter, Alternate Years

Presents bearing capacity, design of shallow foundations, site improvement (preloading, deep densification), and case studies of foundation performance. *Prereq. CIV 3420.*

CIV 3422 Foundation Engineering 3 2 QH
Spring Quarter, Alternate Years
Surveys pile foundations, caissons, selection of foundation scheme, and case studies. *Prereq. CIV 3421.*

CIV 3423 Foundation Engineering 1 and 2 4 QH
Spring Quarter
Embodies the course content offered in CIV 3420 and CIV 3421. *Prereq. CIV 3411 or CIV 3413.*

CIV 3430 Soil-Structure Interaction 4 QH
Winter Quarter, Alternate Years
Introduces pile foundations, beam on elastic foundations, deformations of axially and laterally loaded single piles and pile groups using available computer software. Includes pile load tests and case histories. *Prereq. CIV 3411 or CIV 3413.*

CIV 3440 Experimental Soil Mechanics 4 QH
Spring Quarter, Alternate Years
Offers laboratory evaluation of engineering properties of soils with emphasis on permeability, compressibility and strength. Introduces model analysis of static and dynamic behavior of soils. *Prereq. CIV 3411 or CIV 3413.*

CIV 3450 Engineering Geology 2 QH
Winter Quarter

Presents selected topics in historical and structural geology related to engineering geology. Considers origin and occurrence of various rock types, geologic structures, and faulting and joint systems. Examines weathering of rock and weathering products, glaciation, geologic mapping, and environmental aspects. *Prereq. Undergraduate course in geology.*

CIV 3470 Introduction to Dynamics and Earthquake Engineering 2 QH
Fall Quarter

Introduces dynamic response analysis of one-degree-of-freedom systems, characteristics of earthquakes and resulting ground motions, response spectra, and the stress-strain behavior of soils during dynamic and repeated loading. Includes lab and field determinations, wave propagation through elastic media, and the effect of local soil condition upon earthquake ground motions. *Prereq. Admission to the Geotechnical Engineering Program.*

CIV 3471 Advanced Soil Dynamics 2 QH
Winter Quarter, Alternate Years

Presents dynamics response analysis of a single mass, multidegree-of-freedom systems. Considers machine foundation design and analysis, soil-structure interaction, ground vibrations, sources, and control. Topics include shear strength during repeated loading, liquefaction; and dynamic analysis of retaining structures and slopes. *Prereq. CIV 3470.*

CIV 3480 Seismic Design 2 QH
Spring Quarter, Alternate Years

Surveys earthquake considerations in building design process, and dynamic analysis of multidegree-of-freedom elastic systems subjected to earthquake motions and cyclically applied forces. Discusses inelastic dy-

dynamic response analysis, seismic provisions of building codes, and soil-structure interaction. *Prereq.* CIV 3470.

CIV 3485 Earthquake Engineering 2 QH
Spring Quarter, Alternate Years

Examines seismic hazard and seismic risk analysis, seismic design decision analysis, lifeline earthquake engineering and pipelines, liquid storage tanks, and water distribution systems. Topics include earthquake analysis of earth dams and slopes, dynamic analysis of retaining walls and offshore facilities, and dynamically loaded piles. *Prereq.* CIV 3470.

CIV 3510 Advanced Structural Mechanics 1 2 QH
Fall Quarter

Analyzes force equilibrium (stress), deformation/deplacement (strain), and force/deformation (Hooke's Law) for an elastic solid. Studies compatibility, governing equations for complete and approximate elasticity solution, and plane stress solution for narrow rectangular beams. Considers torsion, Saint Venant's theory, membrane analogy, rectangular sections, and thin open and closed sections. Introduces bending of thin plates. *Prereq.* Undergraduate structural mechanics and structural analysis.

CIV 3511 Advanced Structural Mechanics 2 2 QH
Winter Quarter

Examines consistent models for the mechanics of simple structural elements: axial, bending, plane stress, and the like. Studies equilibrium, geometry of deformation, and force/deformation as the governing relations of all structural elements. Presents work and energy principles: virtual displacement, virtual forces, minimum potential energy, minimum complementary energy. Introduces variational ideas and explores Rayleigh-Ritz method. *Prereq.* CIV 3510.

CIV 3520 Concrete Materials: Science and Technology 2 QH
Winter Quarter

Covers physical and micro-structural properties of hydrated cement. Discusses strength-porosity relationship, the concept of gel/space ratio, transition zone (cement paste-aggregate interface), mix design and procedures, admixtures, and pozzolans. Explores micro-cracking and the stress-strain curve, fracture and failure criteria, and dimensional stability. Topics include creep and shrinkage, durability and permeability, freezing and thawing, sulfate attack, alkali-aggregate reaction, corrosion of reinforcement, surface wear, deterioration control and prevention. Considers concretes for special applications: high-strength, shrinkage-compensating, fibre reinforced, and testing. *Prereq.* Admission to Graduate School of Engineering.

CIV 3521 Fracture and Fatigue 2 QH
Spring Quarter

Examines fracture and fatigue of materials and structures, emphasizing steel and concrete. Studies stress intensity factor, fracture toughness, mixed-mode fracture, linear-elastic versus nonlinear fracture-mechanics, fatigue-crack, initiation and propagation, stress corrosion cracking, corrosion fatigue, fracture criteria, and applications infinite element analysis. *Prereq.* Admission to Graduate School of Engineering.

CIV 3522 Nondestructive Evaluation 2 QH
Spring, Alternate Years

Explores nondestructive testing (NDT) of structures and materials emphasizing concrete and steel. Introduces theory, current technology, and practice including ultrasonic pulse velocity, pulse echo, acoustic emission, radioactive/nuclear, radiography, surface harness, penetration resistance, pullout, maturity, and others. Compares advantages and disadvantages of various methods as to accuracy/variability, safety, and cost effectiveness.

CIV 3525 Stability 2 QH
Spring Quarter

Discusses the prediction of the buckling loads in columns, behavior of beam columns, use of numerical methods to compute the buckling loads of nonprismatic members, and buckling of plates. *Prereq.* CIV 3510 and CIV 3511.

CIV 3530 Finite-Element Analysis of Structures 2 QH
Spring Quarter

Introduces finite-element method for structural analysis. Reviews the direct stiffness method, focusing on formulation of element stiffness matrices by direct use of elasticity relations and by energy methods for simple elements. Topics include axial, bending, plane stress, and plane strain; transformation of coordinate systems; lumping work equivalent loads; bounds on the error solution; plate bending; and use of finite-element computer programs. *Prereq.* CIV 3511.

CIV 3536 Advanced Structural Analysis 2 QH
Winter Quarter

Studies the formulation and solution of structural problems with primary application to member systems (trusses, frames, curved members), matrix formulation of flexibility and stiffness methods, and geometrically nonlinear behavior. *Prereq.* Admission to the Graduate School of Engineering.

CIV 3546 Advanced Structural Dynamics 2 QH
Winter Quarter, Alternate Years

Examines matrix formulation of the dynamic equations of equilibrium, generation of mass, stiffness and damping matrices, static condensation, modal analysis of linear response, and the response spectrum method in modal analysis. Discusses numerical integration techniques for nonlinear analysis of multidegree of freedom systems. *Prereq.* CIV 3470.

CIV 3559 Behavior of Reinforced Concrete Structures 2 QH
Fall Quarter

Covers moment-curvature relationships for reinforced concrete cross sections, and the effect of design parameters in resulting behavior, ductility, and effective stiffness.

CIV 3560 Prestressed Concrete 2 QH
Fall Quarter

Introduces the fundamentals of prestressing, including the design of prestressed concrete beams for flexure and shear and design of end blocks. Covers the load balancing method for the analysis of indeterminate

prestressed structures, and surveys column design. *Prereq. Undergraduate reinforced concrete design and structural analysis.*

CIV 3561 Reinforced Concrete Slabs 2 QH
Spring Quarter

Studies the design of two-way slabs by the equivalent frame method, yield line theory, and prestressing of slabs. Considers the strip method, and introduces folded plate design. *Prereq. Undergraduate reinforced concrete design and structural analysis.*

CIV 3570 Advanced Steel Design 2 QH
Fall Quarter

Offers advanced topics in elastic design in structural steel. Considers design problems involving braced and rigid frame structures subject to gravity, wind, and seismic loads. *Prereq. Undergraduate steel design and structural analysis.*

CIV 3571 Inelastic Steel Design 2 QH
Winter Quarter

Presents advanced topics in analysis and design in structural steel, emphasizing plastic behavior including rigid frame buildings and braced multistory frame buildings. *Prereq. Undergraduate steel design and structural analysis.*

CIV 3575 Bridge Design 2 QH
Winter Quarter, Alternate Years

Studies the behavior of different types of bridge decks, and the design of typical cases using the current AASHTO specifications. Examines the development of mathematical models for analyzing special cases. Topics include curved bridge design and skewed decks. *Prereq. Graduate standing and undergraduate background in steel and concrete design.*

CIV 3610 Urban Public Transportation 2 QH
Fall Quarter, Alternate Years

Considers the analysis and planning of public transportation systems, including bus, subway, commuter rail, and paratransit. Discusses performance prediction, service evaluation and efficiency control measure, demand prediction, and institutional and economic issues. *Prereq. Admission to Graduate School of Engineering.*

CIV 3630 Traffic Engineering 2 QH
Spring Quarter

Focuses on the measurement of traffic characteristics and system performance. Explores the theory of traffic flow and analytical techniques, systems hardware design and evaluation, current concerns of energy, environmental, and urban amenity impacts. Examines computer applications and institutional characteristics. *Prereq. Admission to Graduate School of Engineering.*

CIV 3635 Transportation Engineering 2 QH
Winter Quarter, Alternate Years

Describes and evaluates different modes of transportation, both existing and proposed, and their performance and cost characteristics. Discusses design, performance, and selection criteria for vehicles and roadbeds. *Prereq. Admission to Graduate School of Engineering.*

CIV 3640 Theory and Practice of Transportation Planning 1 2 QH
Fall Quarter

Reviews the establishment of goals, objectives, and criteria. Addresses the current planning framework, and examines the performance characteristics of transportation systems, including public and private modes on land, water, and airways. *Prereq. Admission to Graduate School of Engineering.*

CIV 3641 Theory and Practice of Transportation Planning 2 2 QH
Fall Quarter

Continues CIV 3640. Studies transportation demand modeling from regional economic analysis to traffic and public transportation network assignment. Discusses technical and economic evaluation, and examines current issues, including environmental assessment, transportation systems management, citizen participation, and planning in developing countries. *Prereq. CIV 3640, taken previously or concurrently.*

CIV 3650 Urban Transportation Analysis 1 2 QH
Winter Quarter, Alternate Years

Presents the principles of analysis of urban transportation systems, including travel demand equilibrium, and performance and evaluation techniques using aggregate and disaggregate methods. *Prereq. CIV 3641 and appropriate graduate statistics courses.*

CIV 3651 Urban Transportation Analysis 2 2 QH
Spring Quarter, Alternate Years

Continues CIV 3650. Emphasizes conceptualization, formulation, application, and evaluation of mathematical models utilized in urban transportation systems analysis. Presents case studies of representative analyses. Aims to help prepare students to conceptualize, formulate, apply and evaluate appropriate mathematical modeling techniques in transportation. *Prereq. CIV 3650.*

CIV 3798 Master's Continuation 0 QH
Any Quarter

CIV 3799 Doctoral Continuation 0 QH
Any Quarter

CIV 3830 Special Topic In Civil Engineering 2 QH
Fall, Winter, and Spring Quarters

Offers advanced topics selected and presented by a staff member. *This course is initiated by the appropriate discipline committee and approved by the department. Prereq. Permission of instructor.*

CIV 3835 Special Project in Civil Engineering 2 QH
Any Quarter

An individual effort in an area selected by student and adviser and approved by the departmental discipline committee resulting in a definitive report. *Prereq. Permission of department.*

CIV 3850 Master's Report 4 QH
Any Quarter

An individual effort consisting of laboratory and/or literature investigation and analysis or advanced design of a project in an area of civil engineering selected

by student and adviser resulting in a definitive report. *Prereq. Permission of department.*

CIV 3851 Master's Report 2 QH
Any Quarter

CIV 3860 Master's Thesis 8 QH
Any Quarter

Analytical and/or experimental research conducted by arrangement with and under the supervision of the department. *Prereq. Permission of department.*

CIV 3861 Master's Thesis 4 QH
Any Quarter

CIV 3862 Master's Thesis 2 QH
Any Quarter

CIV 3880 Doctoral Thesis 0 QH
Any Quarter

Open to full-time doctoral students only. Prereq. Admission to doctoral program in civil engineering.

Interdisciplinary Transportation

INT 3798 Master's Thesis Continuation 0 QH
Any Quarter

INT 3835 Special Project in Transportation 2 QH
Any Quarter

An individual effort in an area selected by student and adviser resulting in a definite report. *Prereq. Permission of department.*

INT 3850 Master's Report in Transportation 4 QH
Any Quarter

An individual effort consisting of laboratory and/or literature investigation and analysis or advanced de-

sign of a project in an area of transportation selected by student and adviser resulting in a definitive report. *Prereq. Permission of department.*

INT 3860 Master's Thesis in Transportation 8 QH
Any Quarter

Analytical and/or experimental work conducted by arrangement with and under the supervision of the department. *Prereq. Permission of department.*

Electrical and Computer Engineering

Each course description includes information on the quarter in which classes are usually offered. The quarters listed are presented for planning; however, the Graduate School of Engineering cannot guarantee that all courses will be offered. Students must refer to the Graduate School of Engineering Quarterly Course Offering sheets to determine what courses are actually offered in any given quarter.

ECE 3100 Introduction to Circuits and Systems 4 QH
Fall Quarter

Introduces the circuit elements (R, L, and C) and explores Kirchhoff's laws, Tellegen, Thevenin's theorem, Mesh and nodal analysis. Examines the development of system function approach, Laplace and Fourier transform theory applied to circuit analysis. Other topics include sinusoidal steady-state, n-port network theory, and power and energy concepts. *Prereq. Admission to graduate school.*

ECE 3101 Introduction to Electronics 4 QH
Winter Quarter

Discusses the characteristics of the theoretical physical junction, including the Ebers-Moll model for bipolar junction transistors, characteristics of bipolar and field-effect devices, basic digital inverters and logic gates, and various logic families. Studies the use of transistors in the design of analog circuits. Other topics include biasing, linearized incremental models, load lines, signal flowgraphs, frequency response and gain calculation for single and cascaded stages. *Prereq. ECE 3100 or equiv.*

ECE 3102 Introduction to Electromagnetic Field Theory 4 QH
Spring Quarter

Covers the definition of scalar and vector fields; vector calculus; concepts of gradient, divergence, curl and the "del" operator; and free-space electrostatics. Explores the generalization of the Maxwell equations to the case of time-varying fields; Faraday induction law, wave equations, and the plane wave solution. *Prereq. ECE 3100 or equiv.*

ECE 3103 Introduction to Digital Computers 4 QH
Fall Quarter

Introduces the basic components of digital systems and methods for their analysis and design, including combinational and sequential circuits, integrated circuit logic families and functional building blocks, registers, counters, decoders, multiplexers and memories. Examines data representation and coding techniques. Covers central processor alternatives: instruction formats, addressing modes, bus structures, arithmetic units, timing analysis, and stacks. Surveys algorithms for arithmetic operations with various data representations. *Prereq. Admission to graduate school.*

ECE 3104 Introduction to Communications 4 QH
Spring Quarter

Reviews system theory, convolution, Fourier series, Fourier integral, signal analysis, Fourier methods, correlation functions. Discusses density functions, power spectra, amplitude modulation, frequency modulation, phase modulation, sampling theory and digital modulation techniques. *Prereq. ECE 3108 or equiv.*

ECE 3105 Introduction to System Software 1 2 QH
Fall Quarter

Presents programming style considerations, software testing and software reliability. Demonstrates data structures, including stacks, queues, linked lists, trees and graphs. Emphasizes the use of PASCAL to implement typical system software routines that use the above data structures. Topics include modern system software considerations for multiprocessor, array processor and graphic processor systems. A knowledge of Pascal is helpful but not required for this course. *Prereq. Admission to graduate school.*

ECE 3106 Introduction to Systems Software 2 2 QH
Winter Quarter

Analyzes absolute and relocatable program translators. Topics include assemblers, disassemblers, macroassemblers, linkers, an overview of compilers, interpreters, simulators and emulators. Focuses on design and implementation of an absolute assembler for a very simplified instruction set. *Prereq. ECE 3105.*

ECE 3107 Introduction to System Software 3 2 QH
Spring Quarter

Analyzes operating system structure and concepts including memory management, fragmentation, paging, virtual memory, job and process scheduling, I/O management, and file management. Covers operating system concepts for multiuser systems: critical variables, race conditions, Dekker's algorithm, some sample multiuser routines. Investigates simulated paged memory management and process scheduling routines. *Prereq. ECE 3106.*

ECE 3108 Introduction to Signals and Systems 4 QH
Winter Quarter

Discusses continuous and discrete signals and systems, properties of systems, the input-output relationship of linear time-invariant systems. Other topics include discrete and continuous Fourier series and Fourier transforms, Laplace and z-transforms, and elements of filtering and sampling. *Prereq. ECE 3100 or equiv.*

ECE 3120 Power Circuit Analysis 1 2 QH
Fall Quarter

Introduces fundamental concepts of single-phase and polyphase power systems: definitions of terms, use of per unit quantities, equivalent circuits of symmetrical 3-phase systems, introduction of symmetrical components, short circuits on systems with a single power source. *Prereq. BSEE or ECE 3100 and ECE 3102.*

ECE 3130 Electrical Machinery Theory 1 2 QH
Fall Quarter

Reviews magnetic circuit concepts and electromechanical energy-conversion principles. Discusses steady-state analysis of transformers, synchronous machines, and induction machines. *Prereq. BSEE or ECE 3100 and ECE 3102.*

ECE 3200 Mathematical Methods in 2 QH
Computer Science**Fall Quarter**

Studies algebraic concepts relevant to computer science: sets, relations, mapping, orderings, algebraic systems, Boolean algebras, groups, rings, finite fields. Introduces vector spaces and linear algebras over finite fields. *Prereq. Admission to graduate school.*

ECE 3211 Mathematical Methods in Electrical 4 QH
Engineering 1**Fall and Winter Quarters**

Surveys fundamental algebraic concepts: sets, functions, relations, operations. Presents algebraic structures: group, rings, fields, homomorphisms, polynomials. Studies vector spaces and linear operators: representations, matrices and linear algebraic equations, orthogonality, equivalence and similarity transformations, eigenvalues and eigenvectors, canonical forms, functions of a square matrix, quadratic forms and congruence transformations, orthogonal transformations. Introduces polynomial matrices and applications to communications and control theory. *Prereq. Admission to graduate school.*

ECE 3212 Mathematical Methods in Electrical 2 QH
Engineering 1-A**Fall and Winter Quarters**

ECE 3212 and ECE 3213 cover the same material with the same prerequisites as ECE 3211, but in two 2 QH courses.

ECE 3213 Mathematical Methods in Electrical 2 QH
Engineering 1-B**Winter and Spring Quarters**

Continues ECE 3212. *Prereq. ECE 3212.*

ECE 3221 Linear Systems Analysis 4 QH
Fall and Winter Quarters

Introduces the state variable theory of continuous and discrete linear systems. Topics include standard canonical representations, the concept of state and the representation of interconnected systems, linear spaces, the state equations and their solution, and stability. Introduces the general control problem in terms of controllability and observability. *Prereq. ECE 3211, ECE 3108 or equiv.*

ECE 3222 Linear Systems Analysis A 2 QH
Fall and Winter Quarters

ECE 3222 and ECE 3223 cover the same material with the same prerequisites as ECE 3221, but in two 2 QH courses.

ECE 3223 Linear Systems Analysis B 2 QH
Winter and Spring Quarters

Continues ECE 3222. *Prereq. ECE 3222.*

ECE 3231 Mathematical Methods in Electrical Engineering 2 4 QH
Summer Quarter

Covers complex variable theory and analytic functions and Cauchy-Riemann equations. Investigates complex integration and Cauchy integral formula, Taylor and Laurent Series, the residue theorem, conformal mapping. Other topics include Laplace transform and its applications, problems in partial differential equations, generalized Fourier series and Green's functions, general integral transforms, Sturm-Liouville, Fourier, Hankel, Legendre, and other integral transforms. *Prereq.* Admission to graduate school.

ECE 3232 Mathematical Methods in Electrical Engineering 2-A 2 QH
Summer Quarter

ECE 3232 and ECE 3233 cover the same material with the same prerequisites as ECE 3231, but in two 2 QH courses.

ECE 3233 Mathematical Methods in Electrical Engineering 2-B 2 QH
Summer Quarter

Continues ECE 3232. *Prereq.* ECE 3232.

ECE 3241 Applied Probability and Stochastic Processes 4 QH
Fall and Winter Quarters

Introduces probability, sample space and random variables, examples of discrete and continuous probability distribution functions, averages, moments and characteristic function, multivariate distributions, change of variables and functions of variables, central limit theorem, and description of stochastic vectors. Presents general concepts of stochastic processes: stationarity and ergodicity, stochastic continuity and differentiation, the Gaussian process, linear systems with stochastic inputs, correlation functions and power spectra, matched filtering, stochastic orthogonality and linear mean-square estimation filtering and prediction. *Prereq.* ECE 3108 or equiv.

ECE 3242 Applied Probability and Stochastic Processes A 2 QH
Fall and Winter Quarters

ECE 3242 and ECE 3243 cover the same material with the same prerequisites as ECE 3241, but in two 2 QH courses.

ECE 3243 Applied Probability and Stochastic Processes B 2 QH
Winter and Spring Quarters

Continues ECE 3242. *Prereq.* ECE 3242.

ECE 3302 Power Circuit Analysis 2 2 QH
Winter Quarter

Continues ECE 3120. Considers sequence impedances of various power-system elements from an application point of view. Demonstrates unsymmetrical faults on otherwise symmetrical 3-phase systems, open conductors and asymmetrical connections and loadings. Analyzes simultaneous faults on 3-phase systems. *Prereq.* ECE 3120.

ECE 3303 Power Circuit Analysis 3 2 QH
Spring Quarter

Continues ECE 3302. Introduces Clarke components and applications in analysis of asymmetrical systems and faults. Studies application of Clarke components to the solution of surge phenomena problems. Other topics include transmission line theory and fundamentals of systems stability. *Prereq.* ECE 3302.

ECE 3304 Solid State AC and DC Motor Control Systems 2 QH
Winter Quarter

Focuses on the application of solid-state devices to the control of AC and DC electrical machinery including rectifiers, inverters, choppers, and cyclo-converters, as applied to drive systems in industry and transportation. Emphasizes a case method approach. *Prereq.* BSEE or ECE 3100 and ECE 3101.

ECE 3305 Computers in Power Systems 1 2 QH
Fall Quarter

Introduces techniques used in solving power system problems with the digital computer. Examines matrix formulations. Traces a detailed treatment of the short-circuit problem, including balanced and unbalanced faults. Explores various iterative techniques for the solution of the power-flow problem. *Prereq.* ECE 3120.

ECE 3306 Computers in Power Systems 2 2 QH
Winter Quarter

Discusses practical considerations of solving large scale networks. Studies network reductions, distribution factors and contingency analysis techniques. Examines digital models for regulated generators, fixed and load tap changing transformers and HVDC transmission lines. Develops computer methods for economic dispatch, loss coefficients and application of pumped hydro. *Prereq.* ECE 3305.

ECE 3308 Electrical Machinery Theory 2 2 QH
Winter Quarter

Studies the mathematical description of a synchronous machine. Topics include per-unit representation, steady-state theory and transient performance, and flux distribution and saturation in synchronous machines. *Prereq.* ECE 3130.

ECE 3309 Electrical Machinery Theory 3 2 QH
Spring Quarter

Reviews transient behavior of synchronous machines, stability studies and excitation systems, synchronous machine modeling, generator protection, and trends in development of large generators. *Prereq.* ECE 3308.

ECE 3311 Software Engineering 1 4 QH
Fall Quarter

Introduces basic concepts in software engineering principles. Discusses techniques of structured software design and testing along with issues of program reliability and complexity. Surveys management techniques and explores a case study of a typical large software problem. *Prereq.* ECE 3105, ECE 3106, ECE 3107, or equiv., and a knowledge of a high-level programming language.

ECE 3312 Software Engineering 1-A 2 QH
 Fall and Winter Quarters
 ECE 3312 and ECE 3313 cover the same material with the same prerequisites as ECE 3311, but in two 2 QH courses.

ECE 3313 Software Engineering 1-B 2 QH
 Winter and Spring Quarters
 Continues ECE 3312. *Prereq.* ECE 3312.

ECE 3314 Software Engineering 2 2 QH
 Spring Quarter
 Focus turns away from the general issues of the first two courses in this sequence and toward a very specific issue: modular design of software. Issues of stepwise refinement and top-down design are explored in depth, and organizational/data-flow issues are considered. *Prereq.* ECE 3311 or ECE 3313.

ECE 3321 Digital Signal Processing 4 QH
 Winter Quarter
 Explores the theory and practice of modern signal processing techniques. Covers the characteristics of discrete signals and systems, sampling and A/D conversion, difference equations, and convolution. Considers the z-transform, the Fourier transform, the discrete Fourier transform, fast Fourier transform algorithms, and chirp z-transform algorithm. Other topics include digital filter realizations, design techniques for IIR and FIR digital filters, computer programs for filter design, and quantization effects in digital signal processing. *Prereq.* ECE 3221.

ECE 3322 Digital Signal Processing A 2 QH
 Fall and Winter Quarters
 ECE 3322 and ECE 3323 cover the same material with the same prerequisites as ECE 3321, but in two 2 QH courses.

ECE 3323 Digital Signal Processing B 2 QH
 Winter and Spring Quarters
 Continues ECE 3322. *Prereq.* ECE 3322.

ECE 3325 Numerical Methods and Computer Applications 1 4 QH
 Winter Quarter
 Surveys numerical methods applied to engineering and scientific problems with emphasis on machine implementation and problem solving. Covers roundoff errors and cumulative errors, difference and summation calculus, roots of polynomials and nonlinear functions, orthogonal functions including polynomial, least squares, and Chebyshev approximation of functions. Covers interpolation, numeric quadrature, and numeric integration of ordinary differential equations. *Prereq.* Admission to graduate school and a working knowledge of FORTRAN.

ECE 3326 Numerical Methods and Computer Applications 1-A 2 QH
 Fall and Winter Quarters
 ECE 3326 and ECE 3327 cover the same material with the same prerequisites as ECE 3325, but in two QH courses.

ECE 3327 Numerical Methods and Computer Applications 1-B 2 QH
 Winter and Spring Quarters
 Continues ECE 3326. *Prereq.* ECE 3326.

ECE 3328 Numerical Methods and Computer Applications 2 4 QH
 Spring Quarter
 Analyzes spectral analysis, including fast Fourier transforms, Hilbert transforms, convolution, and correlation techniques. Demonstrates optimization, including dynamic programming and steepest descent techniques. Covers PERT and linear programming. *Prereq.* ECE 3325 or ECE 3327.

ECE 3331 Analog Integrated Circuits 4 QH
 Fall Quarter
 Emphasizes active transistor circuits and systems on modern integrated circuit architectures. Presents bipolar and field-effect (NMOS and CMOS) implementations of analog circuits. Explores characteristics and behaviors of analog IC structures through the study of circuits such as operational amplifiers, instrumentation amplifiers, voltage comparators, various types of filter configuration and integrators, and multipliers and logarithmic amplifiers. Covers linearity, dynamic range, slew-rate limiting, and speed and gain-bandwidth trade-offs. Traces the role of feedback in stabilizing, linearizing, and otherwise enhancing the performance of analog circuits. Explores noise limitations on circuit performance. Develops noise models of devices and circuits, leading to the prediction of system noise performance and techniques for optimizing signal-to-noise ratios. *Prereq.* ECE 3101 or equiv.

ECE 3332 Analog Integrated Circuits A 2 QH
 Fall Quarter
 ECE 3332 and ECE 3333 cover the same material with the same prerequisites as ECE 3331, but in two 2 QH courses.

ECE 3333 Analog Integrated Circuits B 2 QH
 Winter Quarter
 Continues ECE 3332. *Prereq.* ECE 3332.

ECE 3341 Electromagnetic Theory 1 4 QH
 Fall Quarter
 Emphasizes the fundamental equations, their physical meaning, principal mathematical techniques, and important engineering applications. Topics include sources of the EM field; Lorentz force equation; relations and point relations (differential equations and boundary conditions); electromagnetic energy and power; propagation of plane waves in homogeneous media; reflection and transmission; and scalar and vector potentials. Examines solutions in the absence of boundaries for static and dynamic problems, with or without symmetry. Also covers solutions to boundary value problems, Green's functions, transmission lines, resonators, and dielectric slab guide. *Prereq.* ECE 3102 or equiv.

ECE 3342 Electromagnetic Theory A 2 QH
 Fall Quarter
 ECE 3342 and ECE 3343 cover the same material with the same prerequisites as ECE 3341, but in two 2 QH courses.

ECE 3343 Electromagnetic Theory B 2 QH
 Winter Quarter
 Continues ECE 3342. *Prereq.* ECE 3342.

ECE 3344 Electromagnetic Theory 2 4 QH
 Winter Quarter
 Examines important electrodynamic applications using advanced mathematical techniques. Covers the general theory of wave guides and resonators with application to cylindrical geometry. Discusses dielectric rod wave guides, optical fibers, radiation, linear antennas, loop antennas, linear arrays, and ray optics. Studies scattering and diffraction of waves for planar, cylindrical, and spherical geometries, as well as effects of random media. *Prereq.* ECE 3341.

ECE 3345 Electromagnetic Theory 2-A 2 QH
 Winter Quarter
 ECE 3345 and ECE 3346 cover the same material with the same prerequisites as ECE 3344, but in two 2 QH courses.

ECE 3346 Electromagnetic Theory 2-B 2 QH
 Spring Quarter
 Continues ECE 3345. *Prereq.* ECE 3345.

ECE 3347 Computational Methods in Electromagnetics 4 QH
 Spring Quarter
 Presents solutions to problems in electromagnetics, using a variety of numerical and computational methods. Uses finite element methods to solve problems in electrostatics, diffusion, and wave propagation, and moment methods to solve the integral equations related to currents and charges on wire structures. Treats direct and inverse scattering by approximate methods related to physical and geometrical optics. Introduces computational methods for the asymptotic evaluation of radiation integrals and basically non-numerical solutions to integral equations in electromagnetics. Also examines electromagnetic data handling, sampling, and processing. *Prereq.* ECE 3341 and ECE 3344.

ECE 3348 Computational Methods in Electromagnetics A 2 QH
 Fall Quarter
 ECE 3348 and ECE 3349 cover the same material with the same prerequisites as ECE 3347, but in two 2 QH courses.

ECE 3349 Computational Methods in Electromagnetics B 2 QH
 Winter Quarter
 Continues ECE 3348. *Prereq.* ECE 3348.

ECE 3351 Digital Communications 4 QH
 Winter Quarter
 Focuses on the theoretical and practical aspects of digital communications in the presence of channel

distortion and additive noise. Topics include the basic binary and M-ary modulation techniques (PSK, PAM, FSK); orthogonal and biorthogonal signals, and their performance in an additive Gaussian noise channel; signal waveforms constructed from binary block and convolutional codes; hard-decision decoding and soft-decision decoding of coded signal waveforms, performance of coded waveforms in an additive white Gaussian noise channel; and trellis-coded modulation. *Prereq.* ECE 3241 and ECE 3104 or equiv.

ECE 3352 Digital Communications A 2 QH
 Fall Quarter
 ECE 3352 and ECE 3353 cover the same material with the same prerequisites as ECE 3351, but in two 2 QH courses.

ECE 3353 Digital Communications B 2 QH
 Winter Quarter
 Continues ECE 3352. *Prereq.* ECE 3352.

ECE 3361 Detection and Estimation Theory 4 QH
 Winter Quarter
 Presents the classical theory of detection and estimation of signals in noise with emphasis on computer implementation of the theory including hypothesis testing criteria, coherent detection of M-ary signals, diversity receiver, and calculation of error probabilities. Other topics include detection in colored noise, parameter estimation using Bayes, maximum-likelihood, a maximum a posteriori criteria, and applications in pattern recognition and radar. *Prereq.* ECE 3241.

ECE 3362 Detection and Estimation Theory A 2 QH
 Winter Quarter
 ECE 3362 and ECE 3363 cover the same material with the same prerequisites as ECE 3361, but in two 2 QH courses.

ECE 3363 Detection and Estimation Theory B 2 QH
 Spring Quarter
 Continues ECE 3362. *Prereq.* ECE 3362.

ECE 3371 Linear Optimal Control Theory 4 QH
 Spring Quarter
 Covers analysis and design of linear multivariable feedback control systems. Emphasizes state space techniques, and addresses linear optimal regulators and observers, optimal output feedback, tracking and disturbance rejection, robustness analysis, and loop shaping. *Prereq.* ECE 3221 and ECE 3241.

ECE 3372 Linear Optimal Control Theory A 2 QH
 Winter Quarter
 ECE 3372 and ECE 3373 cover the same material with the same prerequisites as ECE 3371, but in two 2 QH courses.

ECE 3373 Linear Optimal Control Theory B 2 QH
 Spring Quarter
 Continues ECE 3372. *Prereq.* ECE 3372.

ECE 3381 Classical Control Theory 4 QH
 Fall Quarter
 Surveys basic systems modeling and steady state and transient response analysis. Introduces root-locus

plots, Bode plots, Nyquist plots, and Nichols chart, and discusses the design of first order cascade and feedback compensators using these plots. Other topics include pole-zero synthesis techniques and design techniques for the optimal linear regulator problem. *Prereq. ECE 3108 or equiv.*

ECE 3382 Classical Control Theory A 2 QH
Fall Quarter

ECE 3382 and ECE 3383 cover the same material with the same prerequisites as ECE 3381, but in two 2 QH courses.

ECE 3383 Classical Control Theory B 2 QH
Winter Quarter

Continues ECE 3382. *Prereq. ECE 3382.*

ECE 3384 Characteristics and Models of Solid-State Devices 1 4 QH
Winter Quarter

Investigates the physics of semiconductors and the operation of semiconductor devices. Topics include crystal structure, energy bands, carrier concentration at thermal equilibrium, semiconductor statistics, carrier transport phenomena, p-n junction theory, charge storage and diode transients, bipolar junction transistors, charge-control model, and the Gummel-Poon model. *Prereq. ECE 3101 or equiv.*

ECE 3385 Characteristics and Models of Solid-State Devices 1-A 2 QH
Fall Quarter

ECE 3385 and ECE 3386 cover the same material with the same prerequisites as ECE 3384, but in two 2 QH courses.

ECE 3386 Characteristics and Models of Solid-State Devices 1-B 2 QH
Winter Quarter

Continues ECE 3385. *Prereq. ECE 3385.*

ECE 3388 Characteristics and Models of Solid-State Devices 2 4 QH

Analyzes metal-semiconductor contacts, methods of measurement of barrier height, MIS diode, C-V measurement to evaluate the interface-trapped charges. Discusses MOSFET device and structure, device scaling and second-order effects, CMOS structure, solid state microwave devices like MESFET, MODFET, and heterojunction bipolar transistor (HBT). Examines noise in the microwave devices. *Prereq. ECE 3384.*

ECE 3389 Characteristics and Models of Solid-State Devices 2-A 2 QH

ECE 3389 and ECE 3390 cover the same material with the same prerequisites as ECE 3388, but in two 2 QH courses. *Prereq. ECE 3384.*

ECE 3390 Characteristics and Models of Solid-State Devices 2-B 2 QH
Continues ECE 3389. *Prereq. ECE 3389.*

ECE 3391 Digital Computer Architecture 4 QH

Deals with the design of new architectures as well as an understanding of those already extant. Considers both the hardware and system software that permit the

system to deal with multiple processes sharing common resources, such as the processor, a bus, primary memory, and disk storage. Topics include the operating system, caches and memory management, and I/O processing. Software topics include exercises in a small subset of VAX assembly language, typical HLL constructs and their translation to VAX assembly code, instructing and addressing mode frequencies, and consideration of the value of different data types. Introduces RISC and CISC architectures. Discusses issues concerning the subdivision of computational tasks and hard-wiring vs. microprogramming. Introduces details of a specific design to focus on solving such critical operations as pipeline design and efficient interrupt handling. *Prereq. A good working knowledge of high-level language programming (Pascal or C, for example), a course in logic (gates, minimization, sequential and combinatorial circuits), and at least a rudimentary idea of assembly language programming and how a computer functions internally.*

ECE 3392 Digital Computer Architecture A 2 QH
Fall and Winter Quarters

ECE 3392 and ECE 3393 cover the same material with the same prerequisites as ECE 3391, but in two 2 QH courses.

ECE 3393 Digital Computer Architecture B 2 QH
Winter and Spring Quarters
Continues ECE 3392. *Prereq. ECE 3392.*

ECE 3394 Microprogramming 2 QH
Spring Quarter

Reviews topics in microprogramming and emulation including microprogramming concepts and techniques; microprogramming design approach using register transfer notation and precedence graphs; microprogrammed computers; bit-slice microprogramming; microprogramming a specific machine for emulation using a microprogramming language and its simulator; and current trends in microprogramming languages and support tools. *Prereq. ECE 3391 or ECE 3393.*

ECE 3395 VLSI Design 4 QH
Spring Quarter

Covers MOS devices and circuits, electrical and logic design, logic arrays, fabrication, design rules, electrical parameters, delays, NMOS and CMOS subsystem design. Covers laboratory design project including layout design and verification. *Prereq. ECE 3101 and ECE 3103 or equiv.*

ECE 3396 VLSI Design A 2 QH
Fall Quarter

ECE 3396 and ECE 3397 cover the same material with the same prerequisites as ECE 3395, but in two 2 QH courses.

ECE 3397 VLSI Design B 2 QH
Winter Quarter
Continues ECE 3396. *Prereq. ECE 3396.*

ECE 3398 VLSI Architectures 4 QH
Covers system clocking and system design issues, control path and data path design, systolic arrays, bit

serial architectures, and design for testability. Introduces silicon compilation. Includes lab project. *Prereq.* ECE 3395.

ECE 3399 VLSI Architectures A 2 QH
ECE 3399 and ECE 3400 cover the same material with the same prerequisites as ECE 3398, but in two 2 QH courses. *Prereq.* ECE 3395.

ECE 3400 VLSI Architectures B 2 QH
Continues ECE 3399. *Prereq.* ECE 3399.

ECE 3401 Digital Systems Design with Hardware Description Languages 4 QH
Spring Quarter
Covers design, simulation, modeling, and implementation of complex digital systems using high-level computer hardware description languages (HDL). Begins with a description of digital system design hierarch and abstraction, followed by a brief overview of available design tools and simulation programs. Introduces HDs, with emphasis on VHDL and AHPL, and investigates using these languages for design and verification of digital systems at different levels of abstraction. Explores the use of VHDL software for design and simulation of large digital circuits. Also addresses silicon compilation, computer-aided design, and automatic generation of hardware. *Prereq.* ECE 3391.

ECE 3402 Digital Systems Design with Hardware Description Languages A 2 QH
Fall Quarter
ECE 3402 and ECE 3403 cover the same material with the same prerequisites as ECE 3401, but in two 2 QH courses. *Prereq.* ECE 3391.

ECE 3403 Digital Systems Design with Hardware Description Languages B 2 QH
Continues ECE 3402. *Prereq.* ECE 3402.

ECE 3412 Power System Planning 4 QH
Spring Quarter
Investigates engineering and economic considerations underlying the planning and development of modern interconnected power systems. Considers overall planning strategies involved in economic comparison of alternative development schemes. *Prereq.* ECE 3120.

ECE 3415 Power System Protection 2 QH
Winter Quarter
Considers protection applied to generation, transmission, and distribution. Investigates the characteristics and operating principles of various methods of protective relaying and analyzes current techniques pertaining to system protection. *Prereq.* ECE 3303.

ECE 3416 Power System Transients 2 QH
Fall Quarter
Examines transients in power systems due to system switching, lightning, or faults. Other topics include traveling-wave phenomena, insulation coordination, overvoltages due to disturbances on the system, and surge protection. *Prereq.* ECE 3303.

ECE 3423 Special Topics in Power Spring Quarter 2 QH
Involves directed reading and discussion of topics of special interest in the power field. Presents series of lectures by guest speakers from industry on topics of particular interest to the power student. *Prereq.* Permission of instructor.

ECE 3424 Power System Dynamics 2 QH
Spring Quarter
Explores transient system models, small and large scale oscillations, solution of swing equation for single and multigenerator cases, load frequency and voltage controllers, and transient stability. *Prereq.* ECE 3303.

ECE 3430 Studies in Electric Power Transmission 2 2 QH
Fall Quarter
Covers elements in the design of AC overhead transmission lines: thermal limitation, series and shunt compensation, and environmental effects. Considers transposition, induced effects, and insulation level. Considers underground alternatives to overhead lines and elements of distribution. *Prereq.* ECE 3303.

ECE 3431 Studies in Electric Power Transmission 2 2 QH
Winter Quarter
Investigates fundamental concepts of high voltage DC power transmission, rectifier and inverter performance, regulation; protection, reactive power and filter requirements, practical arrangement of DC lines, and the impact of a DC line on overall power system operation. *Prereq.* ECE 3303.

ECE 3440 Microprocessor-Based Design 4 QH
Spring Quarter
Explores designing and programming a microcomputer system, including bus interface and timing, interrupts, various peripheral chips, and debugging with the HP64000 emulator. *Prereq.* ECE 3103 or equiv.

ECE 3441 Microprocessor-Based Design A 2 QH
Fall Quarter
ECE 3441 and ECE 3442 cover the same material with the same prerequisites as ECE 3440, but in two 2 QH courses.

ECE 3442 Microprocessor-Based Design B 2 QH
Winter Quarter
Continues ECE 3441. *Prereq.* ECE 3441.

ECE 3443 Theory of Computation 4 QH
Spring Quarter
Focuses on basic abstract models of computation. Topics include Turing machines, primitive recursive functions, recursive systems of equations, and abstract families of algorithms. Examines unsolvable problems and the Recursion Theorem. *Prereq.* ECE 3200.

ECE 3444 Theory of Computation A 2 QH
Fall Quarter
ECE 3444 and ECE 3445 cover the same material with the same prerequisites as ECE 3443, but in two 2 QH courses.

- ECE 3445 Theory of Computation B** 2 QH
Winter Quarter
Continues ECE 3444. *Prereq. ECE 3444.*
- ECE 3447 Switching Theory 1** 4 QH
Spring Quarter
Discusses logical design of combinational switching circuits, including minimization and decomposition of switching functions, multiple output networks, symmetric networks, threshold logic, and fault detection. Analyzes logic design of sequential switching circuits including finite-state machine model, iterative networks, capabilities and limitations of finite-state machines, state equivalence, synthesis of asynchronous sequential circuits, state assignment problem and partition theory, and machine decomposition. Explores logical design of sequential switching circuits, including the finite-state machine model, iterative networks, capabilities and limitations of finite-state machines, state equivalence, synthesis of asynchronous sequential circuits, state assignment problem and partition theory, and machine decomposition. *Prereq. ECE 3200.*
- ECE 3448 Switching Theory 1-A** 2 QH
Fall Quarter
ECE 3448 and ECE 3449 cover the same material with the same prerequisites as ECE 3447, but in two 2 QH courses.
- ECE 3449 Switching Theory 1-B** 2 QH
Winter Quarter
Continues ECE 3448. *Prereq. ECE 3448.*
- ECE 3450 Switching Theory 2** 2 QH
Spring Quarter
Surveys selected topics from the theory of finite automata, including such topics as machine experiments, information lossless machines, linear sequential machines, and finite-state recognizers. *Prereq. ECE 3447 or ECE 3449.*
- ECE 3451 Combinatorial Methods and Optimization Techniques** 4 QH
Winter Quarter
Introduces applied combinatorial mathematics and treats selected topics in enumerative analysis. Topics include permutations, combinations, generating functions, recurrence relations, and the principle of inclusion and exclusion. Discusses Polya's theory of counting and selected topics in optimization techniques, which include transport networks, matching theory, and linear programming, and introduces dynamic programming. *Prereq. ECE 3200.*
- ECE 3452 Combinatorial Methods and Optimization Techniques A** 2 QH
Winter Quarter
ECE 3452 and ECE 3453 cover the same material with the same prerequisites as ECE 3451, but in two 2 QH courses.
- ECE 3453 Combinatorial Methods and Optimization Techniques B** 2 QH
Spring Quarter
Continues ECE 3452. *Prereq. ECE 3452.*
- ECE 3454 Graph Theory** 2 QH
Spring Quarter
Introduces fundamentals of graph theory, including blocks, trees, connectivity, partitions, traversability, line graphs, factorization, coverings, planarity, matrices, digraphs, and enumeration problems. Explores selected applications of graph theory in such fields as network theory, switching theory, and computer science. *Prereq. ECE 3211.*
- ECE 3460 Special Topics in Computer Engineering** 2 QH
Spring Quarter
Investigates aspects of computer engineering not covered in other courses. The subject matter may change from year to year.
- ECE 3463 Robot Vision and Sensors** 4 QH
Winter Quarter
Investigates methods of acquiring, representing, and processing real-world information for robot control. Covers robot vision: low-level vision, real-time image understanding, and theory of motion. Introduces high-level vision by examining problems associated with part acquisition, representation, and reorientation. Covers internal robot sensors, which monitor the state of robot systems, and external robot sensors, which allow the system to interact with its environment. Examines force/torque, touch, proximity, and tactile sensors. *Prereq. ECE 3466.*
- ECE 3464 Robot Vision and Sensors A** 2 QH
ECE 3464 and ECE 3465 cover the same material with the same prerequisites as ECE 3463, but in two 2 QH courses.
- ECE 3465 Robot Vision and Sensors B** 2 QH
Continues ECE 3464. *Prereq. ECE 3464.*
- ECE 3466 Robotics and Automation Systems** 4 QH
Fall Quarter
Studies design and operation of general-purpose and industrial manipulator systems. Topics include robot mobility criteria, kinematic and dynamic models of mechanical arms, joint solution and motion characteristics, trajectory planning, arm control through coordinate transformations, classical feedback methods, modern closed-loop control techniques, and real-time control of robotic systems. *Prereq. ECE 3221.*
- ECE 3467 Robotics and Automation Systems A** 2 QH
Fall Quarter
ECE 3467 and ECE 3468 cover the same material with the same prerequisites as ECE 3466, but in two 2 QH courses.
- ECE 3468 Robotics and Automation Systems B** 2 QH
Winter Quarter
Continues ECE 3467. *Prereq. ECE 3467.*

ECE 3469 Fault-Tolerant Computers 4 QH**Winter Quarter**

Examines concepts of computer systems structures and specifications, software and hardware interactions, failure and reliability, and errors and faults. Studies different types of faults: fault prevention and fault tolerance, redundancy management, reliability, and availability. Compares existing, fault-tolerant computer architectures such as SIFT, FTMP, Tandem 16, and Stratus/32. Techniques of error detection and error recovery. Mechanisms for damage confinement and damage assessment. Study of software fault tolerance techniques such as recovery block scheme, deadline mechanism, and N-version programming scheme. *Prereq.* ECE 3391.

ECE 3470 Fault-Tolerant Computers A 2 QH**Winter Quarter**

ECE 3470 and ECE 3471 cover the same material with the same prerequisites as ECE 3469, but in two 2 QH courses.

ECE 3471 Fault-Tolerant Computers B 2 QH**Spring Quarter**

Continues ECE 3470. *Prereq.* ECE 3470.

ECE 3472 Special Topics In Robotics 4 QH**Spring Quarter**

Focuses on dynamic analysis of manipulator motion, closed-form dynamic robot model construction, and real-time model optimization. Analyzes the influence of actuator models complexity on manipulator control. Also examines adaptive and non-adaptive control of manipulator robots with variable parameters, controllability and stability analysis, state space constraints and avoidance of obstacles, and adaptive identification of states, parameters, and variable payload. *Prereq.* ECE 3466.

ECE 3502 Special Topics In Digital Signal 2 QH**Processing-Fast Algorithms****Fall Quarter**

Surveys fast algorithms for implementation of digital filters and discrete Fourier transforms: FFT, convolution algorithm, Number Theoretic Transforms (NTT), filtering computation, and polynomial transforms. *Prereq.* ECE 3321.

ECE 3503 Two-Dimensional Digital Signal 2 QH**Processing****Winter Quarter**

This course is concerned with two-dimensional digital signal processing which is finding wide applications in many diversified areas. Covers 2-D shift invariant systems along with their stability, the 2-D Discrete Fourier Transform (DFT) and its FFT implementation, and 2-D digital filter design and implementation. *Prereq.* ECE 3321.

ECE 3505 Digital Image Processing 4 QH**Spring Quarter**

Discusses generation of digital image from the source, image digitizers and display devices, image transforms, enhancement techniques such as histogram, equalization, edge sharpening, etc. Other topics include

restoration by Wiener and Kalman filters, image coding using run length coding, DPCM, transform coding, and feature analysis. *Prereq.* ECE 3321.

ECE 3506 Digital Image Processing A 2 QH**Fall Quarter**

ECE 3506 and ECE 3507 cover the same material with the same prerequisites as ECE 3505, but in two 2 QH courses.

ECE 3507 Digital Image Processing B 2 QH**Winter Quarter**

Continues ECE 3506. *Prereq.* ECE 3506.

ECE 3508 Modern Special Analysis 4 QH

Introduces conventional methods of spectrum estimation: periodogram and autocorrelation methods with their smooth versions, the maximum likelihood method of Capon and its modifications, and the maximum entropy method with and without uncertainty in the correlation measurements. Demonstrates the Levinson algorithm, the minimum energy method, weighted Burg techniques, forward-backward least-squares, covariance least-squares, moving average (MA) and ARMA spectrum estimation, model order selection criteria, and harmonic decomposition methods: Prony, Pisarenko, and singular value decomposition methods. Introduces multichannel random processes, multichannel conventional spectrum estimation techniques, parametric modeling of multichannel time series, the Levinson-Wiggins-Robinson algorithm, and multichannel AR spectrum estimation techniques. *Prereq.* ECE 3321.

ECE 3509 Modern Spectral Analysis A 2 QH

ECE 3509 and 3510 cover the same material with the same prerequisites as ECE 3508, but in two 2 QH courses. *Prereq.* ECE 3321.

ECE 3510 Modern Spectral Analysis B 2 QH

Continues ECE 3509. *Prereq.* ECE 3509.

ECE 3511 Data Communications Networks 4 QH**Spring Quarter**

Traces elements of computer-communication networks; network topology and design, elements of protocols, routing and network control, and queuing and congestion control. Describes and compares several existing computer networks. *Prereq.* ECE 3241.

ECE 3512 Data Communications Networks A 2 QH**Winter Quarter**

ECE 3512 and ECE 3513 cover the same material with the same prerequisites as ECE 3511, but in two 2 QH courses.

ECE 3513 Data Communications Networks B 2 QH**Spring Quarter**

Continues ECE 3512. *Prereq.* ECE 3512.

ECE 3514 Error Correcting Codes 4 QH**Spring Quarter**

Covers error correcting codes and their decoding techniques which show promise for applications in digital communication, control, and computer systems. Emphasizes linear block codes based on algebraic struc-

tures; cyclic codes for random error correction (B-C-H codes) and burst error correction. Other topics include convolutional codes and decoding including the Viterbi algorithm, arithmetic codes, combination of codes, and coding for ranging and synchronization. *Prereq.* ECE 3211.

ECE 3515 Error Correcting Codes A 2 QH
Winter Quarter

ECE 3515 and ECE 3516 cover the same material with the same prerequisites as ECE 3514, but in two 2 QH courses.

ECE 3516 Error Correcting Codes B 2 QH
Spring Quarter

Continues ECE 3515. *Prereq.* ECE 3515.

ECE 3517 Information Theory A 2 QH
Winter Quarter

ECE 3517 and ECE 3518 cover the same material with the same prerequisites as ECE 3519, but in two 2 QH courses.

ECE 3518 Information Theory B 2 QH
Spring Quarter

Continues ECE 3517. *Prereq.* ECE 3517.

ECE 3519 Information Theory 4 QH
Fall Quarter

Offers an information theorist's viewpoint of communication systems. Covers concepts, definitions, and results concerning mutual information and entropy for discrete and continuous alphabets. Examines channel capacity and the converse to the coding theorem for discrete memoryless channels; Blahut/Arimoto algorithm for calculating channel capacity; random channel coding concepts; the random coding exponent; and the coding theorem for a noisy channel. Discusses critical rate, cutoff rate, and capacity for system design. Other topics include source coding of continuous and discrete sources, rate-distortion theory, and variable-length source coding via Huffman's algorithm. *Prereq.* ECE 3241 and ECE 3351.

ECE 3520 Special Topics In Communication Theory 2 QH
Spring Quarter

Explores current aspects of communication theory not covered in previous courses. Subject matter may change from year to year. *Prereq.* ECE 3241 and ECE 3351.

ECE 3521 Multidimensional Spectrum Estimation 2 QH

Introduces stationary random fields and their spectrum representation, plane waves and their frequency-wavenumber spectrum, conventional methods (FFT based) and m-D window functions, m-D maximum likelihood method of Capon. Presents 2-D maximum entropy methods, the extendability problem in spectrum estimation, and m-D parametric models for spectrum estimation: separable methods, m-D AR methods, techniques based on minimum variance representations, 2-D ARMA methods, and the m-D Prony and Pisarenko methods. *Prereq.* ECE 3503, and ECE 3508.

ECE 3522 Array Signal Processing 2 QH
Covers arrays systems: configurations, cost, complexity, narrowband and wideband systems. Explores problem formulation, duality between spectrum estimation and array processing, and array processing methods: beamforming, minimum variance distortionless, autoregressive, thermal noise, and music. Other topics include coherent versus incoherent sources, adaptive array processing, sidelobe cancellation, interference rejection, LMS algorithm, wideband array processing techniques, applications to sonar, radar, geophysics, and biomedicine. *Prereq.* ECE 3321.

ECE 3523 Communication Systems 4 QH
Fall Quarter

Focuses on radio communication systems as used in terrestrial and space communication applications. Investigates antenna gain, space loss, cosmic and atmospheric noise, and receiver noise as factors influencing the signal-to-noise ratio in space and satellite repeater systems. Discusses contemporary systems from the standpoint of signal spectrum, noise power and message ambiguity as exhibited at the output of the intermediate frequency receiver. Introduces the theoretical aspects of amplitude and angle modulation systems to cover multiplex systems, signal-to-noise ratio analysis of frequency multiplex systems, and time division multiplex systems. Covers digital systems including sampling, aliasing, and PCM/FM. Considers Bit stream organization for transmission. Discusses a PCM encoder as a means of matching the bit stream to the bandwidth. Examines contemporary communications systems used on balloons, rockets, and satellite repeaters. *Prereq.* ECE 3241 and ECE 3104 or equiv.

ECE 3524 Communication Systems A 2 QH
Fall Quarter

ECE 3524 and ECE 3525 cover the same material with the same prerequisites as ECE 3523, but in two 2 QH courses.

ECE 3525 Communication Systems B 2 QH
Winter Quarter
Continues ECE 3524. *Prereq.* ECE 3524.

ECE 3527 Nonlinear Systems 1 2 QH
Fall Quarter, As Announced

Investigates operators and functionals, functional power series representation of nonlinear systems, functional representation of the response of a nonlinear system when its input is either a constant, a sinusoid, or a transient. Discusses system transforms and applications to the analysis and synthesis of nonlinear systems in terms of functional power series. *Prereq.* ECE 3241 and ECE 3221.

ECE 3528 Nonlinear Systems 2 2 QH
Winter Quarter, As Announced

Studies nonlinear systems with random inputs, functional representation of the response of a nonlinear system when its input is a random process, orthogonal systems of functionals, and representation and analysis of nonlinear systems in terms of orthogonal systems of functionals. Other topics include the optimum nonlinear filter, predictor, and general operator; spe-

cial classes of nonlinear systems; and determination of optimum nonlinear systems for generalized error criteria. *Prereq.* ECE 3527.

ECE 3529 Nonlinear Systems 3 2 QH **Spring Quarter, As Announced**

Studies functional analysis of systems characterized by nonlinear differential equations. Examines operator approach to system theory and its relationship to differential equation representations and the methods of iteration in nonlinear theory and its application to feedback systems. *Prereq.* ECE 3528.

ECE 3530 Three-Dimensional Picture Processing 2 QH **Spring Quarter**

Focuses on the application of computer, optical, and analytic methods in abstracting geometrical information from pictures. Examines the pictorial presentation of data trains into multidimensional pictures and reconstructing of three-dimensional objects from two-dimensional pictures. Discusses applications of X-ray analysis, radar target identification, microscopy, and sensory perception. Students will have the chance to pursue individual projects during the term. *Prereq.* ECE 3321.

ECE 3531 Adaptive Signal Processing 4 QH
Introduces optimum filtering (Wiener-Kalman), signal and system modeling using linear prediction, adaptive filtering (FIR, IIR), fast algorithms for least squares adaptive filters, adaptive array processing, and VLSI architectures for adaptive signal processing. *Prereq.* ECE 3321.

ECE 3532 Adaptive Signal Processing A 2 QH
ECE 3532 and ECE 3533 cover the same material with the same prerequisites as ECE 3531, but in two 2 QH courses. *Prereq.* ECE 3321.

ECE 3533 Adaptive Signal Processing B 2 QH
Continues ECE 3532. *Prereq.* ECE 3532.

ECE 3534 Digital Signal Processing of Speech 4 QH **Signals**

Emphasizes the analysis and recognition of speech using computer techniques. Introduces speech physiology, linguistics, phonetics, and acoustics. Examines models of speech production. Other topics include short-term processing of speech (temporal features, Fourier analysis, applications), theory of linear predictive coding and applications, homomorphic analysis of speech and applications, and speech and speaker recognition. *Prereq.* ECE 3221.

ECE 3535 Digital Processing of Speech Signals A 2 QH
ECE 3535 and ECE 3536 cover the same material with the same prerequisites as ECE 3534, but in two 2 QH courses. *Prereq.* ECE 3321.

ECE 3536 Digital Processing of Speech Signals B 2 QH
Continues ECE 3535. *Prereq.* ECE 3535.

ECE 3537 Multi-User Communication Systems 4 QH
Discusses contention-free multiple-access techniques: frequency-division multiple-access (FDMA) and time-division multiple-access (TDMA). Explores spread-spectrum multiple-access (SSMA) communications:

Direct-sequence SSMA, frequency-hop SSMA, and hybrid SSMA systems. Analyzes communication networks: queuing theory, multiple-access with contention (ALOHA random-access and tree algorithms for random-access), and network routing and flow control (quasi-static control versus dynamic control). Surveys applications of multi-user communication systems: computer-communication networks, broadcast satellite systems, military communications, mobile radio communications, packet-radio communication networks, and fiber-optic local-area networks. *Prereq.* ECE 3351.

ECE 3538 Multi-User Communication Systems A 2 QH
ECE 3538 and ECE 3539 cover the same material with the same prerequisites as ECE 3537, but in two 2 QH courses. *Prereq.* ECE 3351.

ECE 3539 Multi-User Communication Systems B 2 QH
Continues ECE 3538. *Prereq.* ECE 3538.

ECE 3540 Digital Control Systems 4 QH **Spring Quarter**

Analyzes linear discrete-time dynamic systems, discretization of continuous systems, sampling and aliasing. Considers design of digital control systems using transform techniques by discrete equivalent and direct design methods: root locus, Bode and Nyquist diagrams and Nichols charts. Other topics include multivariant digital control using state-space methods: pole placement, observer, and regulator design; controller implementation issues: digital filter realizations, nonlinear effects due to quantization, roundoff, deadband, and limit cycles; selection of the sampling rate. *Prereq.* ECE 3221 and ECE 3381.

ECE 3541 Digital Control Systems A 2 QH **Fall Quarter**

ECE 3541 and ECE 3542 cover the same material with the same prerequisites as ECE 3540, but in two 2 QH courses.

ECE 3542 Digital Control Systems B 2 QH
Winter Quarter
Continues ECE 3541. *Prereq.* ECE 3541.

ECE 3543 Stochastic Control Systems 4 QH **Fall Quarter**

Presents techniques and results of modern stochastic system theory: basics of continuous-time stochastic processes; Markov processes; diffusion processes and drift; solution concepts, Ito integrals, and the Ito formula; fundamentals of martingales; stochastic stability; state estimation and nonlinear filtering; stochastic control; linear stochastic systems: the Kalman filter and LQG control; and application areas. *Prereq.* ECE 3241.

ECE 3544 Stochastic Control Theory A 2 QH **Fall Quarter**

ECE 3544 and ECE 3545 cover the same material with the same prerequisites as ECE 3543, but in two 2 QH courses.

ECE 3545 Stochastic Control Theory B 2 QH
Winter Quarter
Continues ECE 3544. *Prereq.* ECE 3544.

ECE 3546 Advanced Topics in Stochastic and Nonlinear Systems 4 QH

Focuses on current research topics in stochastic systems and nonlinear dynamics. May cover large deviations and stochastic optimization, stochastic stability, global dynamics, bifurcations and singular perturbations, and nonlinear circuits. *Prereq. ECE 3543.*

ECE 3547 Advanced Topics in Stochastic and Nonlinear Systems A Winter Quarter 2 QH

ECE 3547 and ECE 3548 cover the same material with the same prerequisites as ECE 3546, but in two 2 QH courses.

ECE 3548 Advanced Topics in Stochastic and Nonlinear Systems B Spring Quarter 2 QH

Continues ECE 3547. *Prereq. ECE 3547.*

ECE 3549 Multivariable Control Systems Spring Quarter 4 QH

Covers mathematical preliminaries, polynomials, and polynomial matrices; representations of linear multivariable system; matrix fraction description (MFD) and polynomial matrix description (PMD); responses of linear multivariable systems; controllability, observability, and canonical forms; and poles and zeros of multivariable systems. Examines also stability, realization problems, interaction control, state feedback and observer design, compensator design, stability and robustness, noninteraction control, and frequency domain design techniques. *Prereq. ECE 3221 and ECE 3381.*

ECE 3550 Multivariable Control Systems A Fall Quarter 2 QH

ECE 3647 and ECE 3648 cover the same material with the same prerequisites as ECE 3646, but in two 2 QH courses. *Prereq. ECE 3321 and ECE 3381.*

ECE 3551 Multivariable Control Systems B 2 QH

Continues ECE 3550. *Prereq. ECE 3647.*

ECE 3560 Acoustics 1 Fall Quarter 2 QH

Introduces the wave theory of sound including radiation, reflection, and transmission phenomena, distributed system analogies, and sound measurements. *Prereq. ECE 3341.*

ECE 3561 Acoustics 2 Winter Quarter 2 QH

Investigates speech and hearing, microphones and loudspeakers, guided waves, room acoustics, and environmental acoustics. *Prereq. ECE 3560.*

ECE 3562 Acoustics 3 Spring Quarter 2 QH

Focuses on scattering and diffraction, effects of viscosity and heat conduction, and finite amplitude and shock waves. Introduces underwater sound. *Prereq. ECE 3561.*

ECE 3563 Radar Systems 1 Winter Quarter 4 QH

Emphasizes systems aspects of radar engineering. Topics include basic theory of radar detection; measurement of range, angle, and Doppler shift; classes of radar systems; types of radar noise; components of a radar system; matched filters and correlation receivers as applied to radar systems; and fundamental ideas of radar system analysis. Also studies search radar theory; maximum likelihood estimation approach to measurement of radar target parameters; resolution and ambiguity functions applied to radar; and radar parameter uncertainty principles. *Prereq. ECE 3241.*

ECE 3564 Radar Systems 1-A Fall Quarter 2 QH

ECE 3564 and ECE 3565 cover the same material with the same prerequisites as ECE 3563, but in two 2 QH courses. *Prereq. ECE 3241.*

ECE 3565 Radar Systems 1-B Winter Quarter 2 QH

Continues ECE 3564. *Prereq. ECE 3564.*

ECE 3566 Radar Systems 2 Spring Quarter 2 QH

Presents advanced topics in radar systems engineering. Topics include design considerations for multistatic radar systems and synthetic aperture radars; tracking systems; radar wave form synthesis; multifunction array radar techniques; and selected topics in radar sensing techniques and devices. *Prereq. ECE 3563 or ECE 3565.*

ECE 3571 Fourier Optics Fall Quarter 4 QH

Covers optical diffraction and imaging problems as linear systems; necessary tools of Fourier analysis and linear systems analysis for solving the scalar wave equation; waves and their properties; and reflection, refraction, polarization, and propagation of waves. Also examines foundations of scalar diffraction theory—including Fresnel and Fraunhofer diffraction, interferometry, division of amplitude, division of wavefront, interferometric instrumentation, Fourier transforming, image properties of lenses, and coherent and incoherent imaging; and advanced topics in the application of communication theory to optical problems, transfer and spread functions, spatial filtering, and holography. *Prereq. ECE 3581.*

ECE 3572 Fourier Optics 1-A Winter Quarter 2 QH

ECE 3572 and ECE 3573 cover the same material with the same prerequisites as ECE 3571, but in two 2 QH courses. *Prereq. ECE 3581 or ECE 3582.*

ECE 3573 Fourier Optics 1-B Spring Quarter 2 QH

Continues ECE 3572. *Prereq. ECE 3572.*

ECE 3574 Fourier Optics 2 Fall Quarter 2 QH

Covers current topics of interest in Fourier optics and optical instrumentation. Examines application of coherence phenomena to optical instrumentation such as

microdensitometers, microscopes, viewers, cameras, spectrophotometric and interferometric instruments. Other topics include applications of holography, optical data processing and computing, holographic memories, optical modulation, noise and its effects on data collection, synthetic aperture optics, and medical application of laser optics. *Prereq.* ECE 3573 or ECE 3571.

ECE 3576 Lasers 1 2 QH
Fall Quarter

Reviews basic optical principles and atomic physics. Introduces optical coherence, models for the interaction of electromagnetic radiation with matter, and lasers. *Prereq.* ECE 3341.

ECE 3577 Lasers 2 2 QH
Winter Quarter

Investigates laser threshold and rate equations, elementary resonator theory and fabrication, giant pulse operation, specific solid-state, liquid, and gas lasers, and laser systems. *Prereq.* ECE 3576.

ECE 3578 Lasers 3 2 QH
Spring Quarter

Surveys applications of lasers and laser systems for a variety of engineering and basic science disciplines. Examines specific laser optoelectronic devices. *Prereq.* ECE 3577.

ECE 3579 Optoelectronics and Fiber Optics 2 QH

Analyzes elements and characteristics in optical communication systems including elements which generate, transfer, and detect optical signals. Topics include resonance and guiding phenomena, semiconductor physics, LED's, lasers, diode detectors, optical waveguide theory and design, and optical communication systems criteria. *Prereq.* ECE 3580.

ECE 3580 Electro-Optics 1 2 QH
Spring Quarter

Surveys the basic concepts necessary for understanding and evaluating the optics involved in electro-optical systems. Focuses on the optical system as a linear system, matrix methods, diffraction and interference, and imaging and aberrations. *Prereq.* BS degree in engineering or physics.

ECE 3581 Electro-Optics 2 2 QH
Fall Quarter

Surveys the basic concepts necessary for understanding electro-optical devices. Topics include wave propagation in isotropic and nonisotropic media, optics of crystals, polarization, optical resonators, guided waves, modulators and detectors, and thin-film optics. *Prereq.* ECE 3580.

ECE 3582 Electro-Optics 4 QH
Spring Quarter

Covers the same material as in ECE 3580 and ECE 3581. *Prereq.* BS in Engineering or physics.

ECE 3583 Optical Properties of Matter 1 2 QH
Fall Quarter

Introduces the optics of crystals: classification and effects of crystal symmetry on optical properties, classical description of wave propagation in crystals, appli-

cations of the theory to modulation, pulse generation, and nonlinear optics. *Prereq.* BS degree in engineering or physics.

ECE 3584 Optical Properties of Matter 2 2 QH
Winter Quarter

Introduces electro-optical and magneto-optical effects in material media: linear and nonlinear optical materials, elasto-optic and acousto-optical materials, polarization and propagation effects, and modulation. *Prereq.* ECE 3583.

ECE 3585 Optical Properties of Matter 3 2 QH
Spring Quarter

Covers thin films and optical fibers, multilayer filters, dichroics, and integrated optics. *Prereq.* ECE 3584.

ECE 3586 Principles of Optical Detection 4 QH
Spring Quarter

Emphasizes the detector as a component of an optical system. Topics include the laws governing radiation and radiometry; properties of real radiation sources; detailed descriptions of detection devices, noise, contrast, and MTF; imaging and ranging devices; and electro-optical detector systems analysis. Also includes practical consideration of real detectors, resolution and recognition of signals, heterodyne detection, sub-nano second pulse detection, and calibration of electro-optical detectors. *Prereq.* BS degree in engineering or physics.

ECE 3587 Principles of Optical Detection A 2 QH
Winter Quarter

ECE 3587 and ECE 3588 cover the same material with the same prerequisites as ECE 3586, but in two 2 QH courses. *Prereq.* BS degree in engineering or physics.

ECE 3588 Principles of Optical Detection B 2 QH
Spring Quarter

Continues ECE 3587. *Prereq.* ECE 3587.

ECE 3589 Optical Storage and Display 2 QH
Spring Quarter

Surveys materials and methods for the storage and display of information. Topics include photographic film, holograms, storage tubes, magneto-optical films, photochromic materials, electro-optical crystals, evaporated thin films, and liquid crystals. *Prereq.* BS degree in engineering or physics.

ECE 3590 Optical Instrumentation Design 2 QH
Fall Quarter

Introduces the design of optical instrumentation and principles and basic concepts of optical systems. Topics include mechanical shock and vibration, kinematic designs, application of third-order aberrations, simple optical ray tracing, optical testing, tolerances, optical instrumentation, philosophy, functional design, design for quantity production, quality assurance, "special order" design, and industrial design. *Prereq.* BS degree in engineering or physics.

ECE 3591 Spectroscopic Instrumentation 2 QH
Winter Quarter

Surveys optical instrumentation employed in analysis and control situations. Examines modern methods of

spectrometry and interferometry, optimization of analytical systems, topics in electron spectroscopy, X-ray spectroscopy, microwave spectroscopy, and related fields. *Prereq.* ECE 3581.

ECE 3592 Remote Sensing 2 QH
Spring Quarter, As Announced

Focuses on electromagnetic fundamentals related to passive and active remote sensing of the earth. Covers geophysical exploration techniques, radar fundamentals and radar scattering, and instrumentation and data processing. *Prereq.* ECE 3341.

ECE 3593 Plasma Engineering 4 QH
Fall Quarter, As Announced

Reviews the basic principles and applications of plasma and gaseous discharges. Topics include gas kinetics, interaction of electrons and ions with static and rf fields, and wave propagation in plasmas. Discusses applications in material processing, space exploration and microwave devices. *Prereq.* ECE 3341.

ECE 3594 Plasma Theory 4 QH
Winter Quarter, As Announced

Introduces the basic theory of gaseous discharges. Examines fluid and kinetic description of collisionless and collisional plasmas with and without magnetic field effects. Emphasizes linear stability analysis although nonlinear effects will also be discussed. *Prereq.* ECE 3341.

ECE 3595 Plasma Theory A 2 QH
Winter Quarter, As Announced

ECE 3595 and ECE 3596 cover the same material with the same prerequisites as ECE 3594, but in two 2 QH courses.

ECE 3596 Plasma Theory B 2 QH
Spring Quarter, As Announced

Continues ECE 3595. *Prereq.* ECE 3595.

ECE 3597 Optical Properties of Matter 4 QH
Fall Quarter

Embodies the material in ECE 3583 and ECE 3584.

ECE 3600 Microwave Properties of Materials 4 QH

Covers general dielectric and magnetic properties of materials, tensor properties of dielectric and magnetic materials, special microwave properties of thin film materials, and experimental techniques developed in the characterization of microwave materials. *Prereq.* ECE 3102 and ME 1386 or equiv.

ECE 3601 Microwave Properties of Materials A 2 QH

ECE 3601 and ECE 3602 cover the same material with the same prerequisites as ECE 3600, but in two 2 QH courses. *Prereq.* ECE 3102, ME 1326, or equiv.

ECE 3602 Microwave Properties of Materials B 2 QH
 Continues ECE 3601.

ECE 3603 Propagation in Artificial Structures 4 QH

Covers effective dielectric and permeability constants in composite materials at high frequencies, electromagnetic wave propagation in electrical and magnetic anisotropic media, magnetostatic and magneto-elastic wave propagation in single layer, and electromagnetic

wave propagation in multi-layers. *Prereq.* ECE 3102 or equiv.

ECE 3604 Propagation in Artificial Structures A 2 QH
 ECE 3604 and ECE 3605 cover the same material with the same prerequisites as ECE 3603, but in two 2 QH courses.

ECE 3605 Propagation in Artificial Structures B 2 QH
 Continues ECE 3604. *Prereq.* ECE 3604.

ECE 3606 Applications of Plasma Engineering 4 QH
 Covers basic operational principles of microwave electron devices, the theory of electric domain formation, free electron and gaseous lasers, particle beam accelerators, and radiation sources. Topics include both classical microwave devices such as magnetrons, gyrotrons and crossed-field amplifiers, and solid-state devices such as Gunn diodes and Impatt diodes. *Prereq.* ECE 3593.

ECE 3607 Applications of Plasma Engineering A 2 QH
 ECE 3607 and ECE 3608 cover the same material with the same prerequisites as ECE 3606, but in two 2 QH courses. *Prereq.* ECE 3593.

ECE 3608 Applications of Plasma Engineering B 2 QH
 Continues ECE 3607. *Prereq.* ECE 3607.

ECE 3609 Special Topics in Electromagnetics 4 QH
As Announced

Concentrates on inverse problems associated with multidimensional wave equations such as the Schrodinger equation, Maxwell equations, and the elastic-wave equation. Develops the theories using both the operator formalism employed in electromagnetic and acoustic scattering theory. Topics include the inverse Sturm Liouville problem, the deterministic and random inverse source problems, inverse diffraction, and the multidimensional inverse scattering problem. Accompanies the theoretical development with a thorough review of current applications of inverse scattering theory, including structure determination using X-rays and electron probes, S-ray holography, geophysical prospecting and remote sensing, coherent radar imaging, and diffraction tomography. *Prereq.* ECE 3231 and permission of instructor.

ECE 3610 Electronics of Analog Signal Processing 4 QH
Spring Quarter, As Announced

Studies analog signal acquisition and processing utilizing state of the art devices and circuit techniques such as adaptive filters in sampled data systems, CZTs for spectral analysis, correlated double sampling for improved SN ratios, and solid-state imaging systems. Covers linear and nonlinear processing with MOS, bipolar, and CTDs such as CCDs and SAWs. Demonstrates analog versus digital approaches for implementation of similar applications, such as bandwidth requirements, throughput, accuracy, cost, etc. *Prereq.* ECE 3331 and ECE 3384.

ECE 3611 Electronics of Analog Signal Processing A 2 QH
Fall Quarter, As Announced

ECE 3611 and ECE 3612 cover the same material with the same prerequisites as ECE 3610, but in two 2 QH courses.

ECE 3612 Electronics of Analog Signal Processing B 2 QH
 Winter Quarter, As Announced
 Continues ECE 3611. *Prereq.* ECE 3611.

ECE 3613 Microwave Semiconductor Devices and Circuits 4 QH
 Spring Quarter, As Announced

Explores S parameter theory, wave guide junctions, and microstriplines and coplanar wave guides. Studies operation principles of transferred electron devices and avalanche transit time devices such as Gunn diodes, IMPATTs, and TRAPATTs. Also examines parametric devices; microwave transistors such as bipolar transistors and field effect transistors; microwave circuit characterization; and design of amplifiers and oscillators. *Prereq.* ECE 3341 and ECE 3344.

ECE 3614 Microwave Semiconductor Devices and Circuits A 2 QH
 Fall Quarter

ECE 3614 and ECE 3615 cover the same material with the same prerequisites as ECE 3613, but in two 2 QH courses.

ECE 3615 Microwave Semiconductor Devices and Circuits B 2 QH
 Continues ECE 3614. *Prereq.* ECE 3614.

ECE 3616 Active Network Synthesis and Design 4 QH
 Develops multiloop feedback techniques as applied to integrated circuit designs such as three-stage op-amp realizations and minimum sensitivity amplifiers. Analyzes application of these circuits in continuous-time and switched capacitor filters. Develops single-active biquadratic filter sections of Sallen and Key and Friend-Delyannis. Discusses multiloop and multiple-active element realizations such as the generalized impedance converter (GIC), frequency-dependent negative resistance (FDNR), follow-the-leader (FTL) and leap-frog (LF) structures considers sensitivity, yield factors, gain-bandwidth product, and the approximation problem. Develops MOS switched-capacitor realizations of basic filter structures. *Prereq.* ECE 3331.

ECE 3617 Active Network Synthesis and Design A 2 QH
 Fall Quarter

ECE 3617 and ECE 3618 cover the same material with the same prerequisites as ECE 3616, but in two 2 QH courses.

ECE 3618 Active Network Synthesis and Design B 2 QH
 Winter Quarter
 Continues ECE 3617. *Prereq.* ECE 3617.

ECE 3619 Network Synthesis 4 QH
 Fall Quarter

Explores matrix circuit analysis including m-port parameter systems, positive-real functions, and energy functions. Examines driving-point synthesis techniques for LC, RC, and RL networks and driving-point synthesis of RLC networks. Other topics include properties of two-port networks, two-port synthesis, including the parallel ladder realization, and lattice synthesis. *Prereq.* BSEE or ECE 3100 and ECE 3101.

ECE 3620 Network Synthesis A 2 QH
 Winter Quarter

ECE 3620 and ECE 3621 cover the same material with the same prerequisites as ECE 3619, but in two 2 QH courses. *Prereq.* ECE 3100 and ECE 3101.

ECE 3621 Network Synthesis B 2 QH
 Spring Quarter

Continues ECE 3620. *Prereq.* ECE 3620.

ECE 3622 Special Topics In Electronics—Analog MOS LSI Circuits 2 QH
 Spring Quarter

Covers selected topics of practical importance in the design of analog MOS integrated circuits. Topics include NMOS and CMOS technology and devices, MOS transistor analog switch, digital analog converters, comparators, analog digital converters, sampled analog filtering concepts, switched and capacitor filters. *Prereq.* ECE 3331 and ECE 3384.

ECE 3623 Gate Array Design 4 QH
 Fall Quarter

Discusses the design, simulation, verification, and implementation of a CMOS gate array. Describes the VAX-based gate array design and logic simulator tools. Provides design examples of digital logic circuits that will be entered, verified, and simulated. Introduces the GE CMOS Macrocell Circuit Library and TEGAS Logic Simulator. After the completion of this course, the GE Microelectronics Center, at Research Triangle Park, North Carolina, will fabricate the chosen student gate array design projects that can then be tested and evaluated. *Prereq.* ECE 3331.

ECE 3624 Gate Array Design A 2 QH
 Winter Quarter

ECE 3624 and ECE 3625 cover the same material with the same prerequisites as ECE 3623, but in two 2 QH courses.

ECE 3625 Gate Array Design B 2 QH
 Spring Quarter

Continues ECE 3624. *Prereq.* ECE 3624.

ECE 3626 Integrated Circuits Fabrication Processes 1 4 QH
 Winter Quarter

Presents an overview of, and the principles underlying, the basic techniques and processes employed in the fabrication of modern integrated circuits. Topics include crystal growth and epitaxy, oxidation deposition, diffusion and ion implementation, and metallization. Discusses how these processes are combined to yield the current technologies (bipolar, NMOS, CMOS, MESFET). *Prereq.* ECE 3101 or equiv.

ECE 3627 Integrated Circuits Fabrication Processes 1-A 2 QH
 Winter Quarter

ECE 3627 and ECE 3628 cover the same material with the same prerequisites as ECE 3626, but in two 2 QH courses. *Prereq.* ECE 3101 or equiv.

ECE 3628 Integrated Circuits Fabrication Processes 1-B 2 QH
Spring Quarter
 Continues ECE 3627. *Prereq. ECE 3627.*

ECE 3629 Integrated Circuits Fabrication Processes 24QH
Fall Quarter, As Announced

Provides an understanding of the state of the art microelectronic fabrication techniques. Advanced topics include electron beam, ion beam and X-ray lithographic techniques as well as dry processes that include plasma etching, ion beam processes, and reactive ion etching. Discusses the concept of gas and plasma kinetics, as well as mechanisms of sputtering and plasma etching future device development and processing requirement. *Prereq. ECE 3626.*

ECE 3630 Integrated Circuits Fabrication Processes 2-A 2 QH
Fall Quarter, As Announced

ECE 3630 and ECE 3631 cover the same material with the same prerequisites as ECE 3629, but in two 2 QH courses. *Prereq. ECE 3626.*

ECE 3631 Integrated Circuits Fabrication Processes 2-B 2 QH
Winter Quarter, As Announced
 Continues ECE 3630. *Prereq. ECE 3630.*

ECE 3632 Design and Analysis of Digital Integrated Circuits 4 QH
Winter Quarter, As Announced

Discusses the analysis and design of basic digital-integrated-circuit logic families. Examines bipolar circuits, including the advanced-Schottky TTL, emitter-coupled logic. Explores double-buffered CMOS and NMOS logic gates, including dynamic logic circuits such as domino logic memory cells and basic cells in logic arrays. Reviews design considerations such as propagation delay, switching speed, fan-out, and the effect of parasitics. Correlates design techniques with computer simulations. *Prereq. ECE 3101 or equiv.*

ECE 3633 Design and Analysis of Digital Integrated Circuits A 2 QH
Winter Quarter, As Announced

ECE 3633 and ECE 3634 cover the same material with the same prerequisites as ECE 3632, but in two 2 QH courses. *Prereq. ECE 3101 or equiv.*

ECE 3634 Design and Analysis of Digital Integrated Circuits B 2 QH
Spring Quarter, As Announced
 Continues ECE 3633. *Prereq. ECE 3633.*

ECE 3635 Antennas and Radiation 4 QH
Spring Quarter

Focuses on fundamental properties of antennas; linear and aperture antennas including slot, horn, and patch antennas; arrays; receiving antennas; and numerical methods in antenna analysis. Topics include radio wave propagation; antennas over plane and spherical earth; interference, diffraction, surface waves, and ducting; scattering from terrain surfaces; and other propagation topics as time permits. *Prereq. ECE 3341 and ECE 3344.*

ECE 3636 Antennas and Radiation A 2 QH
 ECE 3636 and ECE 3637 cover the same material with the same prerequisites as ECE 3635, but in two 2 QH courses. *Prereq. 3341 and ECE 3344.*

ECE 3637 Antennas and Radiation B 2 QH
 Continues ECE 3636. *Prereq. ECE 3636.*

ECE 3638 Microwave Electron Devices 4 QH
Fall Quarter

Presents the fundamental principles and operation of the major conventional (linear-beam and crossed-field) and novel (maser effect) devices. Examines interactions of non-relativistic and relativistic electron beams with electromagnetic fields; linear-beam tubes (klystron, traveling wave tube, backward-wave amplifier and oscillator, etc.); crossed-field tubes (magnetron, forward and backward cross-field amplifier, high-gain CFA, etc.); and maser-effect devices (cyclotron maser, gyrotron). *Prereq. ECE 3341.*

ECE 3639 Microwave Electron Devices A 2 QH
Winter Quarter

ECE 3639 and ECE 3640 cover the same material with the same prerequisites as ECE 3638, but in two 2 QH courses. *Prereq. ECE 3341.*

ECE 3640 Microwave Electron Devices B 2 QH
 Continues ECE 3639. *Prereq. ECE 3639.*

ECE 3797 Engineer Degree Continuation 0 QH
Any Quarter

Candidates sign up for thesis continuation if their thesis is not completed after they have registered for three consecutive quarters or 10 QH of EE degree thesis. Continuous registration is required until the candidate graduates.

ECE 3798 Master's Thesis Continuation 0 QH
Any Quarter

ECE 3799 Doctoral Dissertation Continuation 0 QH
Any Quarter

ECE 3860 Master's Thesis 8 QH
Any Quarter

Offers analytical and/or experimental work conducted under the auspices of the department. *Prereq. BS degree in engineering or science.*

ECE 3861 Master's Thesis 4 QH
Any Quarter

ECE 3862 Master's Thesis 2 QH
Any Quarter

ECE 3870 Engineer Degree Thesis 8 QH
Any Quarter

Offers analytical and/or experimental work conducted under the auspices of the department. Minimum of 4 QH, maximum of 8 QH allowed per quarter. *Prereq. Admission to Engineering Degree Program.*

ECE 3871 Engineer Degree Thesis 4 QH
Any Quarter

ECE 3872 Engineer Degree Thesis 2 QH
Any Quarter

ECE 3880 Doctoral Thesis 0 QH
Any Quarter
 Offers theoretical and/or experimental work conducted under the auspices of the department. *Prereq.* *Passing of PhD qualifying exam.*

ECE 3887 Master's Seminar 1 2 QH
Any Quarter
 Involves a library survey of a selected topic in the general field of electrical engineering with an oral presentation based on this survey. Requires participation in the departmental seminar program of guest lectures. *Prereq.* *BS degree in engineering or science.*

ECE 3888 Master's Seminar 2 2 QH
Any Quarter
 Requires the preparation of a research paper suitable for publication in a professional journal, plus an oral presentation of this report. *Prereq.* *ECE 3887.*

ECE 3889 Doctoral Seminar 0 QH
Any Quarter
 Requires presentation of a seminar to the electrical engineering department on a subject related to a PhD thesis. The thesis supervisor will coordinate the seminar. *Prereq.* *Passing of PhD qualifying exam.*

ECE 3892 Doctoral Reading 0 QH
Any Quarter
 Includes only material approved by the candidate's adviser. *Only S or F grades will be assigned for this course. Prereq.* *Passing of PhD qualifying exam.*

ECE 3893 Special Problems In Electrical Engineering 2 QH
Any Quarter
 Offers theoretical or experimental work under individual faculty supervision. *Prereq.* *Permission of department chair.*

ECE 3894 Engineer Degree Reading 4 QH
 Taken upon completion of 30 QH of satisfactory course work. *No credits toward course requirements are given.* Minimum of 4 QH, maximum of 8 QH allowed per quarter.

ECE 3895 Engineer Degree Reading 8 QH
Any Quarter

ECE 3896 Special Problems in Electrical Engineering 4 QH
Any Quarter

Biomedical Engineering

INT 3250 Engineering and Medicine 1 2 QH
Fall Quarter
 Discusses the intersection of technology with medicine, historical development of bioengineering profession, and its impact on society. Studies activities embraced by the profession today, including educational, training, and career opportunities in clinical, biomedical, and medical engineering for individuals at the BS, MS, and PhD levels. Examines future goals of engineering in biology and medicine, and issues basic to the relationship between new medical technology and the efficiency and effectiveness of the health care system. *Prereq.* *Permission of instructor.*

INT 3251 Biomedical Applications of Heat and Mass Transfer 2 QH
Winter Quarter
 Studies bioheat equation, thermal transport in living systems, thermal properties, and thermal techniques

in the measurement of blood flow. Presents applications of heat transfer in medicine including hyperthermia for cancer therapy, hypothermia for tissue and organ preservation and cryosurgery, thermal sources for implantable artificial heart, and thermography in cancer detection. *Prereq.* *Permission of instructor.*

INT 3252 Selected Topics In Bioengineering 2 QH
Spring Quarter
 Explores biomedical engineering topics selected from fields of biomaterials, nuclear medicine, radiation diagnosis and therapy, biological transport processes, artificial organs, rehabilitation engineering, and microprocessor based clinical instruments. Introduces medical technology assessment. *Prereq.* *INT 3250 or permission of instructor.*

Industrial Engineering

Each course description includes information on the quarter in which classes are usually offered. The quarters listed are presented for planning; however, the Graduate School of Engineering cannot guarantee that all courses will be offered. Students must refer to the Graduate School of Engineering Quarterly Course Offering sheets to determine what courses are actually offered in any given quarter.

IIS 3100 Basic Engineering Economy Fall and Winter Quarters

2 QH

Presents economic analysis in formulating business policies and selecting alternatives from possible engineering solutions to industrial problems, present worth, annual cost, and rate of return techniques using discrete compound interest calculations. *Prereq.* BS degree in engineering or science.

IIS 3101 Industrial Accounting for Engineers Fall, Winter, and Spring Quarters

2 QH

Introduces basic accounting principles and procedures, including use of accounting data as a management tool. Covers basic cost accounting procedures related to materials, labor, and manufacturing expense cost control. Topics include job order, process, and standard cost systems.

IIS 3102 Introduction to Human Factors Engineering Fall and Winter Quarters

2 QH

Surveys the principal topics and areas of concentration in the field. Introduces sensory physiology and sensory performance; basic motor capabilities and limitations; concepts of the human as a processor of information; and methods of gathering human performance data. *Normally the first course in the human factors areas for students without behavioral science background. Prereq.* IIS 3113 or permission of instructor.

IIS 3103 Basic Operations Research Winter and Spring Quarters

4 QH

Introduces the theory and use of deterministic and stochastic models to represent industrial operations. Discusses models of linear programming, dynamic programming, inventory control, waiting lines, and Markov Chains. *Prereq.* IIS 3113.

IIS 3110 Pascal for Information Systems Fall and Spring Quarters

4 QH

Provides the essentials of Pascal sufficient to support data structure concepts. Topics include algorithms and flow charting, Boolean logic, if-then-else, case, do-while and repeat statements, procedures and functions, one- and two-dimensional arrays, recursion, string processing, records, sets, text files, and pointers and linked lists. *Prereq.* Admission to graduate program.

IIS 3111 Principles of COBOL Fall and Winter Quarters

2 QH

Presents fundamentals of computer programming in COBOL. Topics include elementary computer functioning, program organization, input/output operations, arithmetic and data-handling verbs, and program logic development through the use of flow charts. Introduces storage and manipulation of large data files on magnetic tape. *No prior computer experience is required. Prereq.* Admission to graduate program.

IIS 3112 Quantitative Methods for Information Systems

4 QH

Fall and Winter Quarters

Focuses on the theory and use of deterministic and stochastic models in the context of computer and information systems. Includes models of linear programming, dynamic programming, Monte Carlo simulation, Gantt and Pert charts, multicriteria decision analysis, and waiting lines. Emphasizes applications in a computer and information systems environment. *Prereq.* Admission to graduate program and IIS 3113.

IIS 3113 Basic Probability and Statistics Fall, Winter, and Spring Quarters

4 QH

Offers fundamental concepts of probability. Presents events, same space, discrete and continuous random variables. Discusses density functions, mass functions, cumulative probability distributions, and moments generating functions. Explores expectation of random variables, as well as common discrete and continuous probability distributions including binomial, poisson, geometric, uniform, exponential, and normal. Topics also include multivariate probability distributions, covariance and independence of random variables, sampling and descriptive statistics, parameter estimation, confidence intervals, and hypothesis testing. *Prereq.* Admission to graduate program.

IIS 3116 Assembly Language Fall Quarter

4 QH

Studies microcomputer programming in assembly language, emphasizing structured programming techniques, interrupts, and input/output devices. Introduces microprocessor programming model, instruction set, and addressing modes. Discusses microcomputer system architecture, system resources, interrupt processing, and input/output interfaces. Explores using an assembler and debugger on the IBM-PC, as well as the 8088 instruction set in connection with making interrupt calls to the IBM-DOS. Exercises in data transfer, graphics, and music programs. A macro assembler will be used to write programs. *Prereq.* Higher-level language.

IIS 3200 Organizational Perspectives and Project Management

4 QH

Spring Quarter

Surveys business organization, management, and operation, including business responsibility to its employees, its product, the customer, and the environment in which it operates. Covers planning, forecasting, and budgeting, the financial markets, investing and speculating, as well as the interaction of politics, government and government controls on the industrial enterprise. *Prereq.* Admission to graduate program.

**IIS 3204 Engineering/Organizational Psychology 4 QH
Fall Quarter**

Analyzes the purpose and functioning of organizations as the basic networks for achieving goals through coordination of effort, communication, and responsibility. Emphasizes the role and function of engineering organizations based on modern behavioral science concepts. Covers the application of psychology to industry relative to human relations, group dynamics, tests and measurements, personnel practices, training, and motivation. *Prereq.* Admission to graduate program.

**IIS 3205 Industrial Organizations 2 QH
Winter Quarter**

IIS 3205 and IIS 3206 cover the same material as IIS 3204, but in two 2 QH courses.

**IIS 3206 Industrial Psychology for Engineers 2 QH
Spring Quarter**

IIS 3205 and IIS 3206 cover the same material as IIS 3204, but in two 2 QH courses. *Prereq.* IIS 3205.

**IIS 3207 Financial Management 4 QH
Fall and Winter Quarters**

Studies the issues and processes of short-term financing on industrial firms. Offers financial analysis of cases, supplemented by readings to develop familiarity with sources and uses of working capital as well as the goals and problems involved in its management. Covers the analysis necessary for such long-term financial decisions as issuance of stock or bonds; contracting of leases or loans, and financing of a new enterprise; mergers, capital budgeting, the cost of capital, and the valuation of a business. *Prereq.* IIS 3101.

**IIS 3216 Advanced Engineering Economy 2 QH
Winter Quarter**

Emphasizes the practical application of the techniques studied in basic engineering economy. Explores the problems of implementation through class discussion of cases and student projects, as well as recent advances in the techniques of engineering economy, especially those relating to the consideration of uncertainties. *Prereq.* IIS 3100.

**IIS 3217 Engineering Project Management 4 QH
Winter and Spring Quarters**

Studies the optimization of schedules utilizing pertinent software tools such as the linear programming and project management packages. Examines other graphics software used to draw project diagrams such as Gantt charts, PERT diagrams, manpower loading charts, and funding charts. Considers determination of the critical path and comparison of actual performance with the planned schedule, and discusses the systems life cycle. Addresses needs analysis, requirements definition, preliminary design, detailed design, and implementation in the context of project management.

**IIS 3218 Planning and Managing Information Systems Development 4 QH
Spring Quarter**

Considers the computer system development life cycle, and interactions between the system and the organiza-

tion. Discusses design parameters and tradeoffs, planning for externalities, and individual and organizational aspects of human decision making. Explores the systems approach to planning, management, and control of effective information systems development. Based on extensive use of case studies and will include some guest speakers. *Prereq.* IIS 3615.

**IIS 3219 Cost Accounting and Industrial Budgeting 4 QH
Fall and Spring Quarters**

Studies and evaluates cost accounting procedures in terms of being considered by the engineer for cost determination of alternative engineering proposals and for input into various budgeting plans with which the engineer may become involved. Introduces the essentials of fixed and variable budgeting for production, inventory, sales, cash, capital, and cost-volume profit analysis. *Prereq.* IIS 3101.

**IIS 3220 Development of Engineering Personnel 4 QH
Fall Quarter**

Considers the science and art of managing creative people employed in research, developmental, and engineering activities. Devotes attention to behavioral theories and their applications in the practice of management. Emphasizes each student's experience as an employee or manager. *Prereq.* Admission to graduate program.

**IIS 3302 Advanced Work Design 2 QH
Spring Quarter**

Studies the basic philosophies of work design. Discusses implementation of work design concepts with case studies, and studies and analyzes models such as work sampling, sequence or flow of work models, repetitive and nonrepetitive work models, and work measurement models such as standard data. Topics include human factors in measuring operator performance, regression analysis approaches and emphasizes development of professional, analytical, and managerial skills and abilities at a systems level. *Prereq.* BS degree in engineering or science.

**IIS 3303 Product Design and Value Analysis 2 QH
Winter Quarter**

Studies design parameters and their effect on development, manufacturing, and procurement. Focuses on functional analysis of components and systems, and includes complete projects and case studies. *Prereq.* BS degree in engineering or science.

**IIS 3304 Production Analysis 4 QH
Fall Quarter**

Presents modern quantitative techniques of production planning and control considering deterministic and probabilistic models. Topics include project planning, forecasting, aggregate planning and master scheduling, inventory analysis and control, materials requirement planning, job shop scheduling and dispatching problems. *Prereq.* IIS 3103 and IIS 3113.

**IIS 3305 Case Studies in Industrial Engineering 2 QH
Spring Quarter**

Considers the formulation of problems and analysis of situations on topics such as work measurement, line

balancing, plant layout, regression analysis, wage and salary administration, management information systems and network analysis. Includes class discussion and written analysis of a variety of cases. *Prereq.* IIS 3304 and IIS 3523.

IIS 3307 Introduction to Microprocessors 2 QH
Winter Quarter

Introduces advanced microprocessor systems, including the basic concepts of system architecture, interfaces, and programming using modern 16- and 32-bit microprocessor families. Discusses CPU programming model, instruction set, addressing modes, and exception processing. Topics covered include privilege states, memory management, bus control, principles of assembly language programming, two microprocessor families, and MC 68000 and iAPX 86. *Prereq.* *Structured higher-level language.*

IIS 3308 Microcomputer Applications 2 QH
Spring Quarter

Introduces microcomputer applications in local networks. Focuses on multi-microcomputer systems, bus topology interconnection, communication architecture, and protocols. Examines examples of microcomputer-based local network nodes, local network model, and protocol development. Discusses token bus and collision detection protocols. *Prereq.* *Structured higher-level language and IIS 3307 or equiv.*

IIS 3309 Computer Methods in Manufacturing 4 QH
Fall Quarter

Investigates the use of computers in selected areas of manufacturing systems design. Topics may include numerical control, MRP, process planning and control, and other important applications of computers to manufacturing systems. *Prereq.* IIS 3311 or permission of instructor.

IIS 3310 Manufacturing Methods and Processes 4 QH
Spring Quarter

Explores the structures of polymers (thermoplastic, thermosetting, and glasses) and the manufacturing processes for polymers including thermoforming. Presents the structure of metals and the manufacturing processes for metal forming. Includes a discussion of alloys and welding and brazing. *Prereq.* BS degree in engineering or science.

IIS 3311 Computer-Aided Manufacturing 4 QH
Spring Quarter

Provides an overview of computer-aided manufacturing. Covers the areas that encompass the term CAM: group technology, material requirements planning, part coding and classification, numerical control, part programming and management systems. Broad coverage of each of the areas is given to allow the student to gain an appreciation of the automated factory. *Prereq.* *Higher-level language.*

IIS 3312 Forecasting and Inventory Control 4 QH
Winter Quarter

Examines econometric methods of forecasting the demand for industrial products and emphasizes techniques applicable to individual companies and the total

demand. Uses mathematical model of the causal factors with special attention to determining the reliability of the model. Studies the design and operation of inventory systems from a scientific management point of view, including both required theory and practical aspects. Subjects include inventory control models and techniques, production planning, and control models and methods. *Prereq.* IIS 3103 and IIS 3523.

IIS 3400 Human Factors Engineering 4 QH
Winter Quarter

Covers sensory motor and work environment considerations. Topics include the design of equipment and systems for human use, with the application of engineering psychology; visual and auditory presentation of information; human information processing and skilled task performance. Examines the human as a work-performing, heat-generating physiological engine, and the implied restrictions on the equipment and workplace to provide occupational safety and effective human/machine performance. *Prereq.* IIS 3102.

IIS 3403 Occupational Health and Safety 4 QH
Winter Quarter

Considers safety responsibilities of management and employees, recognition of chemical, electrical, and mechanical hazards, principles of machine guarding, and accident investigation and cost analysis. Reviews record keeping requirements under OSHA Act of 1970, safety programs and inspections, safety training, toxicology, and first aid and medical services. Studies fire prevention and control methods, occupational diseases, and personnel protective equipment. *Prereq.* Admission to graduate program.

IIS 3406 Man/Computer Interaction 2 QH
Spring Quarter

Examines the design and evaluation of the human/computer interface in on-line information systems. Discusses formatting of visual displays and auditory outputs, techniques to facilitate operator inputs, pacing and control of the interactive sequence, operator training, task analysis, and performance testing. Student projects in areas of novel application. *Prereq.* IIS 3401.

IIS 3410 Advanced Human Factors Engineering 4 QH
Winter Quarter

Studies the methods and techniques used to obtain and interpret human performance data. Includes examination of experimental methods and problems peculiar to experimentation with human subjects, unobtrusive measures, and nonreactive techniques, survey design and implementation, and systematic observation techniques. Covers systems analysis and human/machine systems, function and task analysis, task allocation, support equipment and training design, error analysis, occupational safety, preconstruction, and periodic and accident/critical incident analytic techniques. *Prereq.* IIS 3509 and IIS 3400.

IIS 3503 Simulation Methodology and Applications 4 QH
Winter and Spring Quarters

Discusses when, where, and how to use discrete event simulation techniques. Topics include model design,

development, and validation; tactical and strategic planning considerations in the use of the model; input data reduction; alternative programming languages for implementing models; efficiency in running simulations, and statistical reliability in the design and analysis of simulation experiments. Considers special purpose simulation languages, such as SIMSCRIPT, GPSS, and SIMAN. *Prereq.* IIS 3523 and higher-level language.

IIS 3509 Design of Experiments 4 QH
Fall Quarter

Examines the theory and application of experimental design techniques such as modeling and statistics that can optimize resources and improve decision making risks. Covers experiments with single and multiple factors of interest and consider experiments with high order experimental restrictions. Some additional analyses techniques will also be covered. *Prereq.* IIS 3523.

IIS 3512 Stochastic Modeling and Queuing Systems 2 QH
Spring Quarter

Develops the probability techniques necessary for the study of queues, Poisson process, and semi-Markov and Markov process. Analyzes the behavior of queueing systems, single and multiple queues, queues with general arrival and general server, and queues with priority. *Prereq.* IIS 3113.

IIS 3513 Network Analysis and Advanced Linear Programming 4 QH

Examines concepts of network analysis and advanced linear programming. Topics include spanning trees, path and flow algorithms, matchings and coverings, postman and traveling salesman problems, location problems, revised simplex and polynomial bounded algorithms, parametric programming, and concepts of upper bounding and decomposition. *Prereq.* IIS 3103.

IIS 3514 Advanced Operations Research 4 QH
Winter Quarter

Studies important families of mathematical programming problems and optimization methods. Examines generalized networks including the transshipment, shortest route, maximal flow, and the minimal spanning tree problems. Presents the cutting plane and the branch and bound algorithm for binary and mixed integer programming problems. Introduces nonlinear programming including unconstrained optimization, the Kuhn-Tucker conditions, gradient methods, separable, quadratic, and geometric programming. *Prereq.* IIS 3103.

IIS 3516 Statistical Quality Control 4 QH
Fall Quarter

Studies the fundamental concepts of quality planning and improvements. Covers analysis and application of modern statistical process control methods, inspection error, and design of sampling plans. Covers software quality assurance and examines the concepts of Deming, Ishikawa, Feigenbaum, and Taguchi's approach in quality planning, organization, and improvement. *Prereq.* IIS 3113.

IIS 3517 Statistical Decision Theory 2 QH
Winter Quarter

Explores the use of Bayesian statistical inference to arrive at decisions when stochastic variables are interacting. Topics include the relationship to game theory; decision making over time in a sequence; important expected values and distributions; and relationship of Bayesian decision theory to classical statistical inference. *Prereq.* IIS 3506 and IIS 3523.

IIS 3522 Systems Engineering Design and Analysis 4 QH
Spring Quarter

Covers principles of systems modeling and analysis using continuous simulation techniques. Topics include differential equations as system models; Laplace transformations; numerical approximation techniques; stability; steady-state error; control actions; alternative modeling scheme; and validation of system models via continuous simulation techniques. Emphasizes concepts from the production and service-oriented industries. *Prereq.* Higher-level language.

IIS 3523 Applied Statistics 4 QH
Fall and Spring Quarters

Offers development of complete statistical models for the predication and analysis of random phenomena. Topics include goodness of fit and nonparametric tests, analysis of variance, and simple and multiple regression. Introduces the design of experiments, quality control, decision analysis, reliability, and risk assessment. *Prereq.* IIS 3113.

IIS 3524 Advanced Operations Research Topics 4 QH
Spring Quarter

Topics include the revised simplex algorithm, parametric linear programming, and the decomposition principle for large size multidivisional problems. Introduces multi-criteria decision analysis, including the generation of the nondominated solution set, goal programming, evaluation of nondominated solutions, and multi-criteria optimization applications. *Prereq.* IIS 3103.

IIS 3525 Introduction to Reliability Analysis and Risk Assessment 4 QH
Winter Quarter

Introduces probability theory, classical and Bayesian statistics useful for reliability analysis of large, and complex systems. Covers Bayesian probability encoding of experience data, principles of the methods of risk assessment, and reliability analyses including fault trees, decision trees, and reliability block diagrams. Examines practical applications to industrial operations—for example, nuclear and chemical plants, military systems, and large processing plants. *Prereq.* IIS 3113 or permission.

IIS 3526 Advanced Reliability Analysis, Risk Assessment, and Maintenance 4 QH
Spring Quarter

Considers extended application and use of reliability and probabilistic risk analysis methods. Explores methods for common cause/dependent failure analysis, human reliability analysis, and treatment of uncer-

tainties. Examines Bayesian statistics applied to data analysis and discrete probability distribution (DPD) arithmetic for propagation of uncertainty. Studies time-dependent reliability analysis; data types, variable, and constant declarations; enumerations, arrays, sets, records, and pointers; and input/output library functions. Presents the control structures of Modula-2: procedures, modules, and visibility control. Covers sequential and screen-oriented input/output; recursion, concurrency, and low-level facilities; and software design using structured charts. *Prereq.* Admission to graduate program and IIS 3525.

IIS 3535 Reliability Engineering and Testing 4 QH

Introduces the evolving methodology of reliability as a design parameter. Studies the problems of quantifying, assessing, and verifying reliability. Presents various factors that determine the stress and strength of components and their impact on system reliability. Topics include practical applications, examples, and problems in a range of engineering fields, such as mechanical, electrical, industrial, computer structures, and automatic control systems. *Prereq.* IIS 3113.

IIS 3540 Total Quality Control for Engineering 4 QH

Studies principles of Total Quality Control (TQC). Examines Japanese management methods for technologies: manufacturing, electrical, steel and automobile industries. Covers seven statistical methods of TQC: histograms, cause and effect diagrams, check sheets, Pareto diagrams, graphs, control charts, and scatter diagrams. Uses case studies of TQC implementation in technology management with guest lectures by experts. *Prereq.* IIS 3113.

IIS 3601 Compiler Design 4 QH Winter Quarter

Introduces data structures, including stacks and trees, the nature of compiling and interpreting, string manipulation, and code generation. Includes the writing of a compiler in assembly language of a BASIC-like source language as a term project. *Prereq.* IIS 3115, IIS 3116, or IIS 3117.

IIS 3604 Data Structures and Database Management 4 QH Fall and Winter Quarters

Topics include arrays, stacks, lists, linked lists, queues, trees, graphs, symbol tables, and files. Presents a model of each data structure and discusses various implementations in a high-level language. Analyzes algorithms for handling data and shows applications of particular structures in order to emphasize the role of abstraction in problem solving with computers. Covers searching and sorting techniques. *Prereq.* IIS 3106 or IIS 3110.

IIS 3607 Operating Systems and Systems Software 4 QH Winter and Spring Quarters

Studies the concept and components of modern operating systems; including evolution of modern operating systems, operations and services of operating systems; file systems, protection, and implementation; scheduling of processors, multiprogramming; memory management, partitions, virtual memory, overlap, and allocation algorithms. Covers secondary memory

management, scheduling of disks and drums; operating systems deadlocks, detection and prevention; concurrent processes, semaphores, concurrent programming, and synchronization; operating system protection, access matrix, design issues, multilayered approach, and virtual machines. Presents case studies in UNIX, VMS, TOPS, and MULTICS. *Prereq.* IIS 3604 and IIS 3610.

IIS 3610 Computer Architecture 4 QH

Fall and Spring Quarters

Surveys the structure and organization of modern computers, considering digital logic circuits, integrated circuits, and programmed logic arrays. Studies memory organizations, design techniques for large scale memories, and microprocessors. Discusses comparative study of Z80 and MC 68000; interfacing and I/O chips; design specifications of model microcomputers; and microprogramming. Examines the organization of data path and microarchitecture; instruction formats; operating system concepts; assemblers, linkers, and loaders. Topics include multi-level machines and program portability; special topics on super computer architecture; multiprocessors; and non-von Neumann architecture. *Prereq.* IIS 3116.

IIS 3615 Analysis and Design of Computer 4 QH

Information Systems

Fall Quarter

Introduces computer information systems analysis and design techniques and the hardware and software that support such systems. Topics include techniques for determining information requirements for MIS/DSSs, development of the functional systems design and computer system design considerations such as the CPU, main memory, operating systems functions, computer languages, input devices, secondary memory, file organization, database management systems, data communications, data security, and output and display devices. Aims to provide capability in the skeletal design of a computer system to support a given set of management needs. *Prereq.* Admission to graduate program.

IIS 3620 Computerized Financial Control Systems 2 QH Spring Quarter

Considers on-line systems for financial and inventory control from the technological, legal, and social point of view. Focuses on electronic funds transfer (EFT), point of sale (POS) terminals, and associated computing equipment. Emphasizes equipment used for inter-bank and consumer banking transactions, debit card transactions, and retail management information systems to control cash and inventory. Discusses the current technological status and societal implications of EFT and POS terminals. *Prereq.* IIS 3615.

IIS 3621 Information Systems and Society 2 QH

Fall Quarter

Analyzes the role computer systems play in modern society. Contrasts the beneficial use of computers in commercial and industrial enterprises with the potential for infringement of individual privacy rights. Discusses sufficient technical material on computer hardware, software, and data communications to permit

assessment of system feasibility and reviews relevant major legislation that affects the use of computer systems. IIS 3621 and IIS 3617 cover the same material as IIS 3218, but in two 2 QH courses. *Prereq. Admission to graduate program.*

IIS 3622 Information Systems in a Microcomputer Environment 4 QH
Spring Quarter

Explores the role of microcomputers and local area networks in providing decision support information, using the IBM PC, or compatible machine as a representative microcomputer. Topics include PC operating system and hardware fundamentals, software selection for microcomputer based information systems (MBIS), data communications and local area networks of PCs, and approaches to the design and evaluation of MBISs. Assignments using the PC provide the opportunity to understand its capabilities and limitations and evaluate rational approaches to the selection of generic categories of PC software. *Prereq. IIS 3615 or equiv.*

IIS 3623 File Processing 2 QH
Winter Quarter

Studies the processing of sequential, indexed-sequential, and direct/relative data files on tape and disk. Considers record blocking, searching, sorting, and merging operations, and random access techniques. Introduces database management concepts, and if time permits, RPG. *Prereq. Knowledge of COBOL programming or IIS 3111.*

IIS 3624 Software Engineering 1 4 QH
Winter Quarter

Introduces software design techniques, software requirements, and specifications. Examines system architecture design methodology, including classifications, top-down, bottom-up, HIPO, Warnier-Orr, and Jackson design methodologies. Studies data flow charts, module strength and independence, software reliability, and maintainability in the design stage. Considers elements of programming methodology, such as style, tools, environments, and documentation. Discusses software project management, and analyzes programming languages in the light of software engineering principles. *Prereq. IIS 3604.*

IIS 3625 Software Engineering 2 4 QH
Spring Quarter

Presents advanced topics in software engineering. Covers software complexity measures, memory requirements and processing time analysis, program testing and debugging methods, proving programs correct; implementation issues, and elements of reliability theory and applications to software engineering. Examines management of software design projects, as well as software efficiency principles through case studies of large software projects. Investigates application and comparison of various software development tools. *Prereq. IIS 3607 and IIS 3624.*

IIS 3626 Networks and Telecommunications 4 QH
Winter and Spring Quarters

Studies network goals and applications, including architecture, topologies, and protocols. Considers lay-

ered communications protocol design, such as layer functions, interlayer interfaces, and peer processes. Topics include performance measures, data communication techniques, wide area and local networks, channel interfaces and access schemes, workstations and server nodes, distributed systems, and internetworking. *Prereq. IIS 3610.*

IIS 3627 Software Economics 4 QH
Winter Quarter

Examines the constructive cost model (COCOMO model) in the context of the software life cycle through the analysis of case studies. Presents economic analysis tools relative to software development and/or selection, marginal analysis, present value, future worth, and systems analysis techniques. Discusses methods for dealing with uncertainty and performing risk analyses, a seven step program for estimating software cost, COCOMO cost drivers, evaluation procedures, and software project planning and control. *Prereq. IIS 3624.*

IIS 3628 Database Management Systems 4 QH
Fall, Winter, and Spring Quarters

Examines fundamental concepts and design of database management systems (DBMS). Topics include the role of DBMS in organizations; alternative database models—hierarchical, network and relational; underlying data structures for each database model; example DBMS for each model type; design of an information system using a DBMS approach; and practical experience with at least one DBMS on a micro- or mini-computer, such as RBase 5000 or Data-Trieve. *Prereq. IIS 3604.*

IIS 3629 Expert Systems in Engineering 4 QH

Introduces students to the theory, topics, and applications of expert systems in engineering. Topics include knowledge representation formats (production rules, frames, networks, logic systems), heuristics in engineering (deterministic and nondeterministic), fuzzy logic, certainty factors, cognition, memory, decision strategies, design of expert systems, shells, current research goals, and applications in engineering. *Prereq. Admission to graduate program.*

IIS 3630 Introduction to Machine Intelligence 4 QH

Examines intelligent computer systems that exhibit behavior normally attributed to humans: solving problems, reasoning, learning, and handling collections of expert knowledge. Focuses on methods, techniques, and implementations of computer systems for problem solving in engineering. Uses logic and predicate calculus as a starting base; all other representations are explained in terms of the predicate calculus representation. *Prereq. A strong background in structured programming methods (IIS 3106 or equiv.) and data structures (IIS 3604 or equiv.) is required. Lisp or Prolog is desirable but not necessary.*

IIS 3631 Machine Learning 4 QH

Introduces the problem of developing programs that can learn (that is, increment their knowledge in the process of execution). Covers basic principles, techniques, tools, and algorithms for building learning systems. Concentrates on the use of learning algorithms

in software rather than on the human learning mechanisms. Discusses classification of machine learning methodology, algorithms, and programs, as well as current machine learning research being conducted throughout the world. *Prereq.* A high-level programming language (*Lisp* or *Prolog* preferable), and an introductory course to machine intelligence (*IIS 3630* or equiv.).

IIS 3637 Programming Languages for Software Engineering 4 QH
Fall Quarter

Introduces programming languages through available procedural languages and the principles of their design and implementation. Surveys languages historically and provides insight into aspects of programming languages such as control structures, parameter passing conventions, run-time structures, and binding time. Provides exposure to modern representative languages, including limited hands-on experience with block-structure languages, object-oriented languages, and languages for list processing and logic programming. *Prereq.* *IIS 3604*.

IIS 3651 Software Engineering Project 8 QH
Spring Quarter

Offers individual work under faculty supervision. Projects highlighting typical software engineering problems could include: development of integratable RAM resident software for desk-top functions; operating systems development; database management systems; an enhanced word processor-spelling checker-document formatter; language and compiler projects; development of software engineering tools; or software for an engineering workstation. *Prereq.* *IIS 3624*, or permission of instructor.

IIS 3652 Software Engineering Project 1 4 QH
Spring Quarter

IIS 3652 and *IIS 3653* cover the same material as *IIS 3651*, but in two 4 QH courses.

IIS 3653 Software Engineering Project 2 4 QH
Spring Quarter

IIS 3652 and *IIS 3653* cover the same material as *IIS 3651*, but in two 4 QH courses.

IIS 3797 Engineer Degree Continuation 0 QH
Any Quarter

IIS 3798 Master's Thesis Continuation 0 QH
Any Quarter

IIS 3799 Doctoral Dissertation Continuation 0 QH
Any Quarter

IIS 3801 Special Project in Industrial Engineering 2 QH
Any Quarter

Offers individual work under faculty supervision. *Prereq.* Permission of instructor.

IIS 3802 Special Project in Industrial Engineering 4 QH
Any Quarter
Same as *IIS 3801*.

IIS 3803 Independent Study in Operations Research 2 QH
Any Quarter

Presents special topics in operations research by arrangement with a faculty member.

IIS 3804 Special Topics 4 QH
Any Quarter

Offers special topics in IE and IS. *Prereq.* Permission of instructor.

IIS 3805 Special Topics 2 QH
Any Quarter

Offers special topics in IE and IS. *Prereq.* Permission of instructor.

IIS 3806 Seminar in Industrial Engineering 2 QH
Any Quarter

Involves presentations of thesis-related topics by students, as well as presentations and discussions by faculty and eminent people in the field on timely industrial engineering topics. Includes field trips and visitations where appropriate. *Prereq.* Permission of instructor.

IIS 3863 Master's Thesis 2 QH
Any Quarter

Offers analytical and/or experimental work conducted under the auspices of the department. *Prereq.* Permission of adviser.

IIS 3864 Master's Thesis 4 QH
Any Quarter

Same as *IIS 3863*.

IIS 3865 Master's Thesis 8 QH
Any Quarter

Same as *IIS 3863*.

IIS 3870 Industrial Engineer Degree Project 0 QH
Any Quarter

Undertaken with the approval of the candidate's adviser and the department graduate committee.

IIS 3873 Industrial Engineer Degree Project 4 QH
Any Quarter

Same as *IIS 3870*.

IIS 3874 Industrial Engineer Degree Project 2 QH
Any Quarter

Same as *IIS 3870*.

IIS 3881 Doctoral Thesis 8 QH
Any Quarter

Doctoral thesis research conducted under advisership of the doctoral student's dissertation committee.

IIS 3883 Doctoral Thesis 4 QH
Any Quarter

Same as *IIS 3881*.

IIS 3884 Doctoral Thesis 2 QH
Any Quarter

Same as *IIS 3881*.

Mechanical Engineering

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ME 3100 Mathematical Methods for Mechanical Engineers 4 QH
Fall Quarter
 Embodies the material in ME 3101 and ME 3102. *Prereq.* Admission to the Graduate School of Engineering.

ME 3103 Mathematical Methods for Mechanical Engineers 1 2 QH
As Announced
 Presents Bessel and Legendre functions, boundary-value problems and series of orthogonal functions. Discusses partial differential equations and applications to heat transfer, fluid flow, vibrations, and wave propagation. *Prereq.* Admission to the Graduate School of Engineering.

ME 3102 Mathematical Methods for Mechanical Engineers 2 2 QH
As Announced
 Considers vector analysis, divergence theorem, functions of a complex variable, Laurent series and singular points, residues and contour integration, and applications. *Prereq.* Admission to the Graduate School of Engineering.

ME 3120 Theory of Elasticity 4 QH
Fall and Winter Quarters
 Embodies the material in ME 3121 and ME 3122. *Prereq.* Admission to the Graduate School of Engineering.

ME 3121 Theory of Elasticity 1 2 QH
As Announced
 Analyzes Cartesian tensors using indicial notation. Explores stress and strain concepts, point stress and strain, relation to tensor concepts, and governing equations for the determination of stress and displacement distributions in a solid body. Examines exact solutions of the governing equations for elastic solids. *Prereq.* Admission to the Graduate School of Engineering.

ME 3122 Theory of Elasticity 2 2 QH
Winter Quarter
 Considers plane stress and strain problems in rectangular and polar coordinates including thermal stress, and the relation of elasticity theory to strength of materials. Topics include torsion of prismatic and axially symmetric bars, and the bending of thin flat rectangular and circular plates. *Prereq.* ME 3121.

ME 3140 Advanced Dynamics 4 QH
Winter and Spring Quarters
 Embodies the material in ME 3141 and ME 3142. *Prereq.* Admission to the Graduate School of Engineering.

ME 3141 Advanced Dynamics 1 2 QH
As Announced
 Studies kinematics of particles and rigid bodies, modeling and application of fundamental laws of motion, and dynamic response of lumped parameter systems. *Prereq.* Admission to the Graduate School of Engineering.

ME 3142 Advanced Dynamics 2 2 QH
As Announced
 Continues ME 3141. Topics include Lagrange's equations, applications in two and three dimensions, and introduction to vibrations. *Prereq.* ME 3141.

ME 3200 General Thermodynamics 4 QH
Winter Quarter; Spring Quarter, Odd Years
 Examines fundamentals of equilibrium thermodynamics. Topics include work, energy, heat, temperature, available energy, entropy, first and second laws of thermodynamics, and simple systems. Covers closed and open systems, availability loss and irreversibility, heat engines, multicomponent systems, mixtures of gases, chemical reactions, and chemical equilibrium. Equivalent to courses ME 3201 and ME 3202. *Prereq.* Admission to the Graduate School of Engineering.

ME 3201 General Thermodynamics 1 2 QH
As Announced
 ME 3201 and ME 3202 present the same material contained in ME 3200 but in two 2 QH courses. *Prereq.* Admission to the Graduate School of Engineering.

ME 3202 General Thermodynamics 2 2 QH
As Announced
 Continues ME 3201. *Prereq.* ME 3201.

ME 3210 Essentials of Fluid Dynamics 4 QH
Fall Quarter; Winter Quarter, Even Years
 Introduces fluid dynamics as preparation for more advanced courses in the thermofluids curriculum, providing a strong background in fluid mechanics. Topics may include Cartesian tensors, differential and integral formulation of the equations of conservation of mass, momentum, and energy. Covers molecular and continuum transport phenomena; the Navier-Stokes equations; vorticity; inviscid, incompressible flow, the velocity potential, and Bernoulli's equation; viscous incompressible flow; the stream function; some exact solutions; and energy equation including heat conduction and viscous dissipation. This material is also covered in the two 2 QH courses ME 3211 and ME 3212. *Prereq.* Admission to the Graduate School of Engineering.

ME 3211 Essentials of Fluid Dynamics 1 2 QH
As Announced
 ME 3211 and ME 3212 present the same material with the same prerequisites as ME 3210, but in two 2 QH courses. *Prereq. Admission to the Graduate School of Engineering.*

ME 3212 Essentials of Fluid Dynamics 2 2 QH
As Announced
 Continues ME 3211. *Prereq. ME 3211.*

ME 3250 Advanced Physical Metallurgy 1 2 QH
Fall Quarter, Odd Years
 Examines dislocation theory, including such topics as dislocation stress fields, self-energy, velocity, interaction mechanisms, image forces, and theories of yielding. *Prereq. A recent introductory materials science course.*

ME 3251 Advanced Physical Metallurgy 2 2 QH
Winter Quarter, Odd Years
 Studies mechanical behavior of composites. Covers application of dislocation theory to micro-plasticity, strain hardening, strengthening mechanisms, and creep. *Prereq. ME 3250.*

ME 3252 Advanced Physical Metallurgy 4 QH
 Embodies the material in ME 3250 and ME 3251. *Prereq. A recent introductory materials science course.*

ME 3260 Thermodynamics of Materials 1 2 QH
Fall Quarter, Odd Years
 Presents basic metallurgical thermodynamics encompassing first, second, and third laws, entropy, enthalpy, and free energy. *Prereq. Engineering materials.*

ME 3261 Thermodynamics of Materials 2 2 QH
Winter Quarter, Odd Years
 Continues ME 3260, emphasizing solutions, activity, activity coefficients, the phase rule, and applications to some metallurgical problems. *Prereq. ME 3260.*

ME 3264 Thermodynamics of Materials 4 QH
 Embodies the material in ME 3260 and ME 3261. *Prereq. Engineering materials.*

ME 3270 Materials Science and Engineering 1 2 QH
As Announced
 Explores the principles underlying the structure and properties of solid materials. Considers the relationships of these principles to the properties and to applications in structures and devices. Uses both macroscopic-phenomenological and electronic-molecular approaches. Includes metals, alloys, semiconductors, and dielectrics. Topics may include atomic and electronic structures, ordering, nucleation, crystal growth, and thermal properties. *Prereq. A recent introductory materials science course.*

ME 3271 Materials Science and Engineering 2 2 QH
As Announced
 Continues ME 3270. Considers topics such as electric, magnetic, and optical properties; applications of solid-state phenomena to achieve functions embodied in transducers, filters, amplifiers, energy converters, and so forth. *Prereq. ME 3270.*

ME 3272 Materials Science and Engineering 4 QH
Fall Quarter
 Embodies the material in ME 3270 and ME 3271. *Prereq. A recent introductory materials science course.*

ME 3341 Power Generating Systems 1 2 QH
As Announced
 Examines power generating systems that employ fossil, nuclear, and heat recovery boilers operating in conjunction with steam and organic Rankine cycles. Studies the steady-state and transient operation of each power-generating system from both an analytical and conceptual point of view. Presents the effect that site conditions, fuel quality, plant loadingschedule, and environmental regulations have on system design, performance, and operation. *Prereq. ME 3200 or equiv., or may be taken concurrently with permission of instructor.*

ME 3342 Power Generating Systems 2 2 QH
As Announced
 Continues ME 3341. Examines systems incorporating gas, hydraulic, and wind turbines, solar and fuel cells, energy storage, combined cycles, and cogenerating systems. Aims to develop, in conjunction with ME 3341, the skills needed to conduct sound technical evaluations of the power generating systems being built today. *Prereq. ME 3341.*

ME 3343 Power Generation Economics and Planning 2 QH
As Announced
 Examines current and constant-dollar power generation costs. Considers life-cycle economic analysis, such as revenue requirements, discounted cash flow, internal rate of return, and payback analyses. Presents the planning methodologies used by electric utilities and private industry to evaluate and select power generating systems. *Prereq. ME 3342.*

ME 3351 Solar Thermal Engineering 1 2 QH
As Announced
 Develops a model for the hourly direct and diffuse radiation under a cover of scattered clouds and the transmission and absorption of this radiation by passive and active systems. Considers the design of air heating systems, and the storage of the collected energy by a pebble-bed, as well as elements of heat exchanger design. Studies the economics of a domestic water and/or space heating system using f-chart analysis. *Prereq. CHE 3660 or equiv.*

ME 3352 Solar Thermal Engineering 2 2 QH
As Announced
 Considers design and analysis issues of several solar thermal systems, such as LiBr-H₂O absorption cooling units, heat pumps, compound parabolic collectors, and the heat pipe type of solar collector. *Prereq. ME 3351.*

ME 3360 Turbomachinery Design 4 QH
Fall Quarter
 Presents preliminary design methods and analytical tools applicable to turbomachinery. Discusses design criteria and performance characteristics at design and off-design operating conditions for several important

types of turbomachinery. Studies axial flow compressors and turbines (gas and steam) in depth, including topics such as compressor surge, turbine blade cooling, steam wetness effects, centrifugal compressors, radial inflow turbine, pumps, fans, and water turbines. Examines turbomachinery mechanical design limitations, the use of empirical data on blade cascade performance in blade selection, and numerical methods of analyzing two- and three-dimensional flows in turbomachinery (for example, conformal transformation and streamline curvature). Two in-depth design projects are assigned. This material is also covered in the two 2 QH courses, ME 3361 and ME 3362. *Prereq. Admission to the Graduate School of Engineering, including undergraduate preparation in fluid mechanics and thermodynamics.*

ME 3361 Turbomachinery Design 1 2 QH
As Announced

ME 3361 and ME 3362 present the same material contained in ME 3360, but in two 2 QH courses. *Prereq. Admission to the Graduate School of Engineering, including undergraduate preparation in fluid mechanics and thermodynamics.*

ME 3362 Turbomachinery Design 2 2 QH
As Announced
Continues ME 3361. *Prereq. ME 3361.*

ME 3370 Fundamentals of Maintenance in Design 4 QH
Spring Quarter, Odd Years
Covers basic tools of probability analysis. Presents failure modes and actual functional behavior of designed components in the probability forms, and age reliability. Offers nondescriptive evaluation techniques and demonstration tests. Explores fault tree analysis and decision logic. *Prereq. Admission to the Graduate School of Engineering.*

ME 3380 Fundamentals of Instrumentation 2 QH
Fall Quarter
Discusses the theoretical principles underlying the design and operation of instruments for measurement and/or control. Analyzes stimulus-response relations, and covers industrial instruments for measurement and control, including those based on pneumatic and electrical systems. *Prereq. BS degree.*

ME 3381 Industrial Process Control 2 QH
Winter Quarter
Introduces fundamental principles involved in automatic control of industrial processes. Considers economics, and the application of control instruments to obtain automatic control of temperature, pressure, fluid flow, liquid level, humidity, and PH. *Prereq. ME 3380.*

ME 3386 Nuclear Engineering 1 2 QH
As Announced
Studies the growth of the nuclear power industry; nuclear physics, emphasizing atomic and nuclear structure, radioactive decay, and nuclear reactions with particular attention to fission and fusion. Examines radiation health physics, principles of shielding, nuclear instrumentation; production and application

of radioisotopes, neutron interactions and slowing down theory, and neutron activation analysis. *Not open to students who have completed ME 1541 and ME 1542. Prereq. Admission to the Graduate School of Engineering.*

ME 3387 Nuclear Engineering 2 2 QH
As Announced

Compares thermal, fast, and breeder reactors. Explores four factor formula and the neutron diffusion equation; one-group, modified one-group, two-group and multi-group theory; bare and reflected thermal reactors; energy production and distribution within core; and flux shaping. Topics include transient reactor behavior and control; factors affecting reactivity including temperature, pressure, void formation, fission product accumulation, fuel depletion and fuel breeding; and Xenon buildup after shutdown. *Not open to students who have completed ME 1541 and ME 1542. Prereq. ME 3386.*

ME 3388 Nuclear Engineering 3 2 QH
As Announced

Presents reactor design considerations, and the inter-relationship of reactor physics, control, engineering, materials, safety, and fuel cycle management. Topics include reactor types, radiation damage and reactor materials, nuclear fuels, reactor heat transfer, economics of nuclear power, and environmental effects. *Not open to students who have completed ME 1541 and ME 1542. Prereq. ME 3387.*

ME 3400 Advanced Math Methods for Mechanical Engineers 4 QH
Fall Quarter
Embodies the material in ME 3401 and 3402. *Prereq. ME 3100.*

ME 3401 Advanced Math Methods for Mechanical Engineers 1 2 QH
As Announced
Studies matrices and linear equations, variational calculus and applications, approximate methods of engineering analysis, and selected topics of current interest. *Prereq. ME 3101 and ME 3102.*

ME 3402 Advanced Math Methods for Mechanical Engineers 2 2 QH
As Announced
Discusses integral transforms, asymptotic expansion, and regular and singular perturbation methods. Draws examples from solid mechanics, vibration, and fluid mechanics. *Prereq. ME 3101 and ME 3102.*

ME 3410 Numerical Methods in Mechanical Engineering 4 QH
Winter Quarter

Presents numerical methods applied to problems in mechanical engineering. Considers solution of linear and nonlinear systems of equations, interpolation, numerical differentiation and integration, and numerical solution of ordinary differential equations. Includes explicit and implicit methods, multistep methods, and predictor-corrector methods. Studies numerical solution of partial differential equations

with emphasis on parabolic and elliptic problems occurring in mechanical engineering. This material is also covered in the two 2 QH courses ME 3411 and ME 3412. *Prereq. ME 3100.*

ME 3411 Numerical Methods in Mechanical Engineering 1 2 QH
As Announced

ME 3411 and ME 3412 present the same material with the same prerequisites as ME 3410, but in two 2 QH courses.

ME 3412 Numerical Methods in Mechanical Engineering 2 2 QH
As Announced

Continues ME 3411. *Prereq. ME 3411.*

ME 3420 Mechanics of Inelastic Solids 4 QH
As Announced

Studies constitutive relations governing inelastic solids, including yield surface, plastic stress-strain relations, and Prandtl-Reuss equations. Examines viscoelastic stress-strain relations, the Maxwell and Voigt models, as well as viscoplasticity. *Prereq. ME 3122. Not available to students who have taken ME 3421.*

ME 3421 Introduction to Plasticity 2 QH
Winter Quarter, Even Years

Presents basic experimental information. Reviews stress and strain tensors, elastic stress-strain relations, yield surface, plastic stress-strain relations, Prandtl-Reuss equations, and simple applications. *Prereq. ME 3121.*

ME 3423 Theory of Elasticity 3 2 QH
Spring Quarter

Discusses approximate solutions for stress and displacement distributions in elastic solids, and discrete solutions using finite difference and finite element methods. Covers energy principles and the calculus of variations, and the use of energy principles to obtain approximate continuous solutions. *Prereq. ME 3122.*

ME 3431 Engineering Fracture Mechanics 4 QH
Fall Quarter, Odd Years
Embodies the material in ME 3432 and ME 3433. *Prereq. ME 3120.*

ME 3432 Engineering Fracture Mechanics 1 2 QH
As Announced
Examines the fundamentals of brittle fracture, theoretical strength, micro/macro fracture characteristic, Inglis-Griffith theory, and applicability. Topics include linear elastic fracture mechanics; Orowan/Irwin extension to metals, effective surface tension, and relation to fracture toughness; plastic zone size correction; geometry effects on fracture toughness; and plane strain/plane stress fracture toughness, and thickness effects. *Prereq. ME 3122.*

ME 3433 Engineering Fracture Mechanics 2 2 QH
As Announced

Focuses on experimental determination of fracture toughness, slow crack growth "pop in," arrest, R-G curves, and compliance techniques for determining elastic energy release rate. Considers alternate frac-

ture toughness concepts, including resistance curve, crack opening displacement, and the J integral. Studies the application of fracture mechanics to fatigue, and emphasizes design methods to minimize risks of catastrophic failure. *Prereq. ME 3432.*

ME 3434 Engineering Factors Mechanics 3 2 QH
As Announced

Studies application of fracture mechanics to fatigue, strain energy density criteria for fracture, arrest criteria, and includes a "Work of Fracture" specimen. Considers the application of fracture mechanics to structural analysis, and the effect of anisotropy in fracture mechanics. Examines fracture dynamics, dynamic fracture toughness, strain rate effects, microsecond fracture phenomenon and criteria, spall, Butcher-Tuler criterion, and NAG model. Emphasizes the residual strength and design approaches. *Prereq. ME 3433.*

ME 3440 Advanced Mechanics of Materials 4 QH
Winter Quarter

Embodies the material in ME 3441 and ME 3442. *Prereq. Admission to the Graduate School of Engineering.*

ME 3441 Advanced Mechanics of Materials 1 2 QH
As Announced

Reviews fundamental stress and deformation concepts, and strain energy density. Introduces energy methods with application to beams, frames and rings. Discusses the Ritz method. *Prereq. Admission to the Graduate School of Engineering.*

ME 3442 Advanced Mechanics of Materials 2 2 QH
As Announced

Investigates beams on elastic foundations and the concept of stability as applied to one and two degree-of-freedom systems. Topics include buckling of bars, frames, and rings. *Prereq. ME 3441.*

ME 3443 Advanced Mechanics of Materials 3 2 QH
As Announced
Offers selected topics in advanced mechanics. *Prereq. ME 3442 or permission of instructor.*

ME 3446 Theory of Shells 2 QH
Spring Quarter, Odd Years

Studies membrane theory of shells, analyzes cylindrical shells, and examines the general theory of thin elastic shells and shells of revolution. *Prereq. ME 3122.*

ME 3455 Mechanics of Composite Materials 2 QH
Winter Quarter, Odd Years

Focuses on constitutive equations for anisotropic laminated composite materials, and application to the structural response of beams and plates. Discusses bending and buckling of symmetric and nonsymmetric laminates. *Prereq. ME 3121.*

ME 3464 Automatic Control Engineering 4 QH
Fall Quarter, Even Years
Embodies the material in ME 3466 and ME 3467. *Prereq. ME 3140.*

ME 3466 Automatic Control Engineering 1 2 QH
As Announced

Studies control action, and the analysis and design by use of root-locus and frequency-domain techniques. *Prereq.* *Permission of instructor.*

ME 3467 Automatic Control Engineering 2 2 QH
As Announced

Offers further consideration of linear systems including compensation methods and multiple-input, and the techniques for the treatment of nonlinear systems. *Prereq.* *ME 3466.*

ME 3468 Robot Mechanics and Control 4 QH
Fall Quarter

Focuses on kinematics and dynamics of robot manipulators. Covers the development of kinematic equations of manipulators, the inverse kinematic problems, and motion trajectories. Explores the dynamics of manipulators for the purpose of control, employing Lagrangian mechanics, and considers the control and programming of robot manipulators. Discusses steady state errors and calculations of servo parameters, as well as high-level programming languages. *Prereq.* *ME 3142.*

ME 3470 Vibration Theory and Applications 4 QH
Spring Quarter

Embodies the material in ME 3472 and ME 3473. *Prereq.* *ME 3142 or ME 3471.*

ME 3472 Vibration Theory and Applications 1 2 QH
As Announced

Investigates Laplace transformation techniques, phase-plane diagrams, multiple-degree-of-freedom systems, and free and forced vibrations with and without damping. *Prereq.* *ME 3471, ME 3142, or permission of instructor.*

ME 3473 Vibration Theory and Applications 2 2 QH
As Announced

Presents systems with distributed mass and stiffness, extensional, torsional, and flexural vibrations of bars. *Prereq.* *ME 3472.*

ME 3474 Vibration Theory and Applications 3 2 QH
As Announced

Offers selected topics of current interest in vibrations. *Prereq.* *ME 3473.*

ME 3475 Random Vibration 2 QH
Fall Quarter, Odd Years

Presents a description of stochastic processes, and explores the impulse response and frequency response of linear time-invariant dynamic systems. Examines correlations and spectra of stationary response, cross-rates, peaks, and envelopes. Topics include failure under random loading; poisson pulse processes; measurement, identification, and response problems; coherence; space-time correlations and cross-spectra; digital data processing; and applications to vehicles and structures subjected to wide-band excitation. *Prereq.* *ME 3473.*

ME 3480 The Finite Element Method 4 QH
Spring Quarter

Embodies the material in ME 3481 and ME 3482. *Prereq.* *ME 3101 and ME 3102 or permission of instructor.*

ME 3481 Finite Element Analysis 2 QH
As Announced

Introduces the finite element method, including variational formulations, simple interpolation functions, and element stiffness matrices. Discusses triangular and rectangular elements, assembly technique and constraining of resulting equations, and elementary applications. *Prereq.* *ME 3101 and ME 3102 or permission of the instructor.*

ME 3482 Advanced Finite Element Method 1 2 QH
As Announced

Examines isoparametric element formulation of higher-order and three-dimensional elements. Studies the Rayleigh-Ritz and Galerkin formulations. Considers applications of finite element theory to mechanical engineering problems in the areas of solid mechanics, heat transfer, and fluid mechanics. Reviews the use of a finite element general purpose commercial package. *Prereq.* *ME 3481.*

ME 3483 Advanced Finite Element Method 2 2 QH
Fall Quarter, Even Years

Explores the dynamic finite element formulation with explicit and implicit time integration schemes for transient analysis. Studies solution methods for finite element equilibrium equations, including material and geometrical nonlinearities. Presents the general structure of computer procedures and codes, the influence of computer-aided design technology, and the use of an in-house general purpose commercial code. *Prereq.* *ME 3482.*

ME 3500 Computer-Aided Graphics and Design 4 QH
Winter Quarter

Covers the basic aspects of interactive computer graphics. Topics include hardware and software concepts, design principles for the user-computer interface, geometrical transformation, display architecture, and data structures. Studies algorithms for removing hidden edges and surfaces, shading models, and intensity and colors. Considers the concepts of computational and numerical geometry and design of curves and surfaces. Examines solid modeling techniques, and discusses in-house computer-aided graphics and design packages. *Prereq.* *Admission to the Graduate School of Engineering and programming experience.*

ME 3520 Experimental Techniques in Design 4 QH
Winter Quarter

Focuses on state of the art experimental techniques and their application in the design process. Topics include mechanical testing, vibration, thermofluids measurements, nondestructive evaluation, analog/digital data acquisition, and computer processing of experimental data. *Prereq.* *Admission to the Graduate School of Engineering.*

ME 3525 Manufacturing Methods for Engineers 4 QH
Spring Quarter

Concentrates on manufacturing methods and their effects on the design, performance, and economy of engineering products. Discusses traditional material removing, forming, and joining processes and newly developed methods for producing and processing high-performance and specialty materials such as composites, superalloys, and electronic materials. Also covers fundamentals of nondestructive material testing, automated manufacture, and computer-aided design (CAD) and manufacturing (CAM). Emphasizes case studies related to complex manufacturing problems. *Prereq.* Admission to the Graduate School of Engineering.

ME 3540 Heat Conduction and Thermal Radiation 4 QH
Winter Quarter

Studies the formulation of steady and unsteady state one- and multidimensional heat conduction problems. Examines solution techniques for linear problems including the method of separation of variables, Laplace transforms, and integral transforms. Discusses approximate analytical methods, phase change problems, nonlinear problems, the nature of thermal radiation, blackbody, and radiation from a blackbody. Presents radiation from a nonblack surface element, and radiative exchange among surfaces separated by a nonparticipating medium. Investigates the interaction of radiation with other modes of heat transfer in nonparticipating media. Numerical techniques in heat transfer are covered in ME 3410. This material is also covered in the two 2 QH courses ME 3541 and ME 3542. *Prereq.* ME 3100 and undergraduate course in heat transfer.

ME 3541 Heat Conduction and Thermal Radiation 1 2 QH
As Announced

ME 3541 and ME 3542 present the same material with same prerequisites as ME 3540, but in two 2 QH courses.

ME 3542 Heat Conduction and Thermal Radiation 2 2 QH
As Announced

Continues ME 3541. *Prereq.* ME 3541.

ME 3544 Convective Heat Transfer 4 QH
Fall Quarter

Studies fundamental equations of convective heat transfer, heat transfer in incompressible external laminar boundary layers, and integral boundary layer equations. Examines laminar forced convection in internal flows, and turbulent forced convection in internal and external flows. Draws analogies between heat and momentum transfer, including the Reynolds, Taylor, and Martinelli analogies. Topics include natural convection, heat transfer in high-speed flow, transient forced convection, and convection and radiation in nonparticipating media. This material is also covered in the two 2 QH courses ME 3545 and ME 3546. *Prereq.* ME 3100, ME 3210, and undergraduate course in heat transfer.

ME 3545 Convective Heat Transfer 1 2 QH
As Announced

ME 3545 and ME 3546 present the same material with the same prerequisites as ME 3544, but in two 2 QH courses.

ME 3546 Convective Heat Transfer 2 2 QH
As Announced

Continues ME 3545. *Prereq.* ME 3545.

ME 3548 Radiative Transfer 4 QH
Spring Quarter, Even Years

Examines electromagnetic background, and the fundamentals of radiation in absorbing, emitting, and scattering media. Studies the equation of radiative transfer, approximate methods in the solution of the equation of radiative transfer, and singular-eigenfunction expansion technique. Discusses pure radiative transfer in participating media, interaction of radiation with conduction and/or convection, and the Monte Carlo technique. This material is also covered in the two 2 QH courses ME 3549 and ME 3550. *Prereq.* ME 3540.

ME 3549 Radiative Transfer 1 2 QH
As Announced

ME 3549 and ME 3550 present the same material with the same prerequisites as ME 3548, but in two 2 QH courses.

ME 3550 Radiative Transfer 2 2 QH
As Announced

Continues ME 3549. *Prereq.* ME 3549.

ME 3552 Two Phase Flow 4 QH
Winter Quarter, Even Years

Studies the basic concepts of heat and mass transfer associated with phase change and multiphase flows. Discusses boiling heat transfer (nucleate boiling, film boiling and bubble dynamics); evaporation and condensation; liquid-gas two phase flow and gas-solid and liquid-solid two phase flows. This material is also covered in the two 2 QH courses ME 3553 and ME 3554. *Prereq.* ME 3100 (or equiv.) and undergraduate course in heat transfer.

ME 3553 Two Phase Flow 1 2 QH
As Announced

ME 3553 and ME 3554 present the same material as ME 3552 with the same prerequisites, but in two 2 QH courses.

ME 3554 Two Phase Flow 2 2 QH
As Announced

Continues ME 3553. *Prereq.* ME 3553.

ME 3556 Heat Transfer Processes in 4 QH
Microelectronic Devices**Spring Quarter**

Discusses and develops state of the art methods used to predict the heat transfer rates from microelectronic devices and packages and to simulate transport phenomena in manufacturing processes associated with microelectronic devices. Topics, selected from the current literature, may include use of latent heat

reservoirs, boiling jet impingement cooling, control volume approaches to extended surfaces, and calculation of thermal contact conductances and natural convection in enclosures. Develops simulation of laser-assisted thermophoretic deposition and laser cladding processes. This material is also contained in the two 2 QH courses ME 3557 and ME 3558. *Prereq. ME 3100 (or equiv.) and undergraduate course in heat transfer or permission of instructor.*

ME 3557 Heat Transfer Processes in Microelectronic Devices 1 2 QH
As Announced

ME 3557 and ME 3558 provide the same material as ME 3556 with the same prerequisites, but in two 2 QH courses.

ME 3558 Heat Transfer Processes in Microelectronic Devices 2 2 QH
As Announced
Continues ME 3557. *Prereq. ME 3557.*

ME 3560 Viscous Flow 4 QH
Winter Quarter, Odd Years
Reviews conservation of mass, momentum, and energy for compressible viscous flow. Discusses the mathematical character of the basic equations and analysis of some exact solutions. Investigates low Reynolds number flow, exact and approximate approaches to laminar boundary layers in high Reynolds number flows, and stability of laminar flows and the transition to turbulence. Considers incompressible turbulent mean flow, internal and external flows, and extensions to compressible boundary layers. This material is also covered in the two 2 QH courses ME 3561 and ME 3562. *Prereq. ME 3100 and ME 3210.*

ME 3561 Viscous Flow 1 2 QH
As Announced
ME 3561 and ME 3562 present the same material with the same prerequisites as ME 3560, but in two 2 QH courses.

ME 3562 Viscous Flow 2 2 QH
As Announced
Continues ME 3561. *Prereq. ME 3561.*

ME 3564 Gas Dynamics 4 QH
Spring Quarter, Odd Years
Studies the consequences of fluid compressibility. Discusses shock waves and the theory of characteristics, focusing on two-dimensional steady flows and one-dimensional unsteady flows. Topics may include axially symmetric steady flow, small perturbation theory, similitude rules, the hodograph method, or some aspects of physical acoustics. This material is also contained in the two 2 QH courses ME 3565 and ME 3566. *Prereq. ME 3210.*

ME 3565 Gas Dynamics 1 2 QH
As Announced
ME 3565 and ME 3566 present the same material with the same prerequisites as ME 3564, but in two 2 QH courses. *Prereq. ME 3210.*

ME 3566 Gas Dynamics 2 2 QH
As Announced
Continues ME 3565. *Prereq. ME 3565.*

ME 3568 Computational Fluid Dynamics with Heat Transfer 4 QH
Spring Quarter
Examines finite difference methods for solving partial differential equations with particular emphasis on the equations of fluid dynamics and convective heat transfer. Discusses integral methods for boundary layers and their coupling to potential flow solutions. Considers the use of coordinate transformations and body-oriented coordinate systems. Presents the application of superposition techniques in convective heat transfer problems. This material is also covered in the two 2 QH courses ME 3569 and ME 3570. *Prereq. ME 3210 and ME 3410.*

ME 3569 Computational Fluid Dynamics with Heat Transfer 1 2 QH
As Announced
ME 3569 and ME 3570 present the same material with the same prerequisites as ME 3568, but in two 2 QH courses.

ME 3570 Computational Fluid Dynamics with Heat Transfer 2 2 QH
As Announced
Continues ME 3569. *Prereq. ME 3569.*

ME 3572 Aerosol Mechanics 4 QH
As Announced
Studies the behavior of ultrafine particles from both microscopic and macroscopic viewpoints. Discusses the microscopic origins of aerosol transport phenomena including Brownian diffusion, drag, thermophoresis, condensation, and evaporation. Examines deposition processes for monodisperse aerosols including distribution function for polydisperse aerosols, the general dynamic equation and methods of solution, homogeneous nucleation, and coagulation. Introduces industrial applications. *Prereq. ME 3100, ME 3200, ME 3210, or permission of instructor.*

ME 3580 Statistical Thermodynamics 4 QH
Spring Quarter, Even Years
Introduces mechanical engineers to statistical thermodynamics, providing insight into the laws of classical thermodynamics and the behavior of substances. Topics include: introduction to probability; elementary kinetic theory of an ideal gas, including the distribution of molecular velocities and the mean free path treatment of transport properties; classical statistics of independent particles, equipartition of energy, the partition function and laws of thermodynamics; some results from quantum mechanics, quantum statistics of independent particles; applications to gases; introduction to ensembles and systems of interacting particles. This material is also contained in the two 2 QH courses ME 3581 and ME 3582. *Prereq. ME 3100 and ME 3200 or equiv.*

ME 3581 Statistical Thermodynamics 1 2 QH
As Announced
 ME 3581 and ME 3582 present the same material with the same prerequisites as ME 3580, but in two 2 QH courses.

ME 3582 Statistical Thermodynamics 2 2 QH
As Announced
 Continues ME 3581. *Prereq. ME 3581.*

ME 3584 Fundamentals of Combustion 4 QH
Fall Quarter, Even Years
 Offers comprehensive treatment of the problems involved in the combustion of liquid, gaseous, and solid fuels in both laminar and turbulent flow. Discusses the fundamentals of chemical kinetics, and examines the equations for the transport of mass, momentum, and energy with chemically reacting gases. Topics include diffusion and premixed flames, combustion of droplets and sprays, and gasification and combustion of coal. This material is also presented in the two 2 QH courses ME 3585 and ME 3586. *Prereq. ME 3200.*

ME 3585 Fundamentals of Combustion 1 2 QH
As Announced
 ME 3585 and ME 3586 present the same material as ME 3584, with same prerequisites, but in two 2 QH courses.

ME 3586 Fundamentals of Combustion 2 2 QH
As Announced
 Continues ME 3585. *Prereq. ME 3585.*

ME 3600 Advanced Physical Metallurgy 3 2 QH
Spring Quarter, Odd Years
 Studies the kinetics of phase transformations in metals. Topics include kinetic theory, empirical kinetics, diffusion in metals, nucleation, diffusional growth, and martensitic transformations. *Prereq. A recent introductory materials science course.*

ME 3601 Thermodynamics of Materials 3 2 QH
Spring Quarter, Odd Years
 Examines the application of metallurgical thermodynamics to various process metallurgical problems, such as gas-solid systems, plus kinetics of reactions, and dynamic systems analysis. *Prereq. ME 3260 or ME 3261.*

ME 3602 Materials Science and Engineering 3 2 QH
As Announced
 Continues ME 3271 with a discussion of various special topics that will vary from year to year. For example metastable phases and thin films. *Prereq. ME 3271.*

ME 3603 Corrosion 2 QH
As Announced
 Studies the thermodynamics of corrosion and corrosion reactions both in aqueous and non-aqueous environments. Topics include thermodynamics, kinetics, and the effects of environment and physical metallurgy. Considers applications to automotive design, and exterior and interior structures. *Prereq. Admission to the Graduate School of Engineering.*

ME 3604 Oxidation 2 QH
As Announced
 Examines the thermodynamics of oxidation and the effect of environment on rates of oxidation. Topics include thermodynamics, kinetics, mechanisms, and effect of environment. Assesses ferrous and nonferrous metals as well as polymers. *Prereq. Admission to the Graduate School of Engineering.*

ME 3605 Electronic Materials 1 2 QH
Fall Quarter, Odd Years
 Presents generic techniques for fabrication and processing, and the resulting structure-property relationships, for materials utilized in electronics. Materials may include bulk single crystals, thin films, metals, semiconductors, and insulators. *Prereq. ME 3271.*

ME 3606 Electronic Materials 2 2 QH
Winter, Odd Years
 Continues ME 3605. *Prereq. ME 3605.*

ME 3607 Electronic Materials 4 QH
As Announced
 Embodies the material in ME 3605 and ME 3606. *Prereq. A course in material science and engineering.*

ME 3610 Introduction to Diffraction 2 QH
Methods in Material Science
As Announced
 Studies the general principles of the diffraction by materials of short wave length radiations, such as X-ray, electrons, and thermal neutrons. Focuses on the similarities and differences of the different radiations when applied to the study of the structures of crystalline and noncrystalline materials. *Prereq. A recent introductory materials science course.*

ME 3611 Diffraction Methods in Material Science 2 QH
As Announced
 Continues ME 3610, emphasizing experimental methods and applications. Topics include choice of radiation, introduction to instrumentation, sample preparation, methods of detection and recording of the diffracted radiation, and analysis, interpretation and use of the results. *Prereq. ME 3610.*

ME 3612 Microstructure Analysis 1 2 QH
Fall Quarter, Even Years
 Discusses the principles of scanning and transmission electron microscopy, including image interpretation in transmission electron microscopy with an emphasis on the study of the relationships between microstructure and properties of materials. Considers application of kinematical and dynamical theories of electron diffraction to quantitative analyses of point defects, dislocations, precipitates, and grain boundaries. Includes laboratory demonstration of TEM and SEM operation. *Prereq. Admission to the Graduate School of Engineering.*

ME 3613 Microstructure Analysis 2 2 QH
Winter, Even Years
 Continues ME 3612. *Prereq. ME 3612.*

ME 3620 Powder Metallurgy Spring Quarter, Even Years Studies powder characteristics and methods of manufacturing. Considers powder pressing, including packing, interparticle bonding, and effects of pressure. Discusses the principles of sintering, as well as the characteristics and properties of products made from powdered materials. <i>Prereq.</i> A recent introductory materials science course.	2 QH	ME 3798 Master's Degree Continuation Any Quarter	0 QH
ME 3625 Physical Ceramics 1 Fall Quarter, Even Years Introduces ceramic fabrication processes, including the characteristics of vitreous and crystalline solids, structural imperfections, and atomic mobility. Explores phase equilibria, nucleation, crystal growth, solid-state reactions, non-equilibrium phases, and effects on the resulting microstructure of ceramics. <i>Prereq.</i> A recent introductory materials science, physical chemistry, or solid state physics course.	2 QH	ME 3799 Doctoral Continuation Any Quarter	0 QH
ME 3626 Physical Ceramics 2 Winter Quarter, Even Years Discusses the effects of composition and microstructure on the thermal, mechanical, optical, electrical, and magnetic properties of ceramic materials. <i>Prereq.</i> ME 3625.	2 QH	ME 3850 Special Problems in Mechanical Engineering Any Quarter Offers theoretical or experimental work under individual faculty supervision. <i>Prereq.</i> Permission of department faculty.	2 QH
ME 3630 The Structure and Properties of Polymeric Materials 1 Fall Quarter, Even Years Introduces the organic chemistry of polymers, effect of chemical composition on structure, melting point and glass transition temperature, polymer characterization and degradation, and thermodynamics of polymers. <i>Prereq.</i> Undergraduate materials science course.	2 QH	ME 3853 Special Topics in Mechanical Engineering Any Quarter Presents topics of interest to the staff member conducting this class for advanced study. <i>Prereq.</i> Permission of department faculty.	2 QH
ME 3631 The Structure and Properties of Polymeric Materials 2 Winter Quarter, Even Years Examines rheology and mechanical behavior of polymers, analysis and testing, effects of processing on structure and physical properties, industrial polymers, and resin base composites. <i>Prereq.</i> ME 3630.	2 QH	ME 3854 Special Topics in Mechanical Engineering Any Quarter Presents topics of interest to the staff member conducting this class for advanced study. <i>Prereq.</i> Permission of department faculty.	4 QH
ME 3640 Computer Modeling of Materials Processing As Announced Focuses on the use of numerical methods for modeling a variety of materials processes, for example, melting, oxidation, reduction, the blast furnace, the cupola, rolling, and extrusion. <i>Prereq.</i> Admission to the Graduate School of Engineering.	2 QH	ME 3856 Doctoral Reading Any Quarter Studies material approved by the candidate's adviser (only S or F grades will be assigned for this course). <i>Prereq.</i> Passing of PhD qualifying exam.	2 QH
ME 3641 Computer Modeling of Materials Properties As Announced Uses various mathematical techniques and computer methods to develop models that describe the changes in a material's chemical, mechanical, and physical properties as the chemical composition and metallurgical variables are changed. <i>Prereq.</i> Admission to the Graduate School of Engineering.	2 QH	ME 3860 Master's Thesis Any Quarter Includes analytical or experimental work conducted under the direction of the faculty in fulfillment of the requirements for the degree. First-year students must attend a graduate seminar program that will introduce the students to the methods of choosing a research topic, conducting research, and preparing a thesis. Successful completion of the seminar program is required. <i>Prereq.</i> Admission to the Graduate School of Engineering.	6 QH
ME 3797 Engineer Degree Continuation Any Quarter	0 QH	ME 3861 Master's Thesis Any Quarter Same as ME 3860.	4 QH
		ME 3862 Master's Thesis Any Quarter Same as ME 3860.	2 QH
		ME 3870 Mechanical Engineer's Thesis Any Quarter Offers analytical and/or experimental work conducted under the auspices of the department. <i>Open to day students only.</i> <i>Prereq.</i> Admission to the Mechanical Engineer Degree Program.	0 QH
		ME 3871 Mechanical Engineer's Thesis Any Quarter Offers analytical or experimental work conducted under the auspices of the department. <i>Open to day students only.</i> <i>Prereq.</i> Admission to the Mechanical Engineer Degree Program.	4 QH

ME 3872 Mechanical Engineer's Thesis 2 QH
Any Quarter
Same as ME 3872.

ME 3880 Doctoral Dissertation 0 QH
Any Quarter
Presents theoretical and experimental work conducted under the supervision of the department. *Open to day students only. Prereq. Admission to the Doctoral Program in Mechanical Engineering.*

Graduate School of Nursing

Core courses in the Graduate School of Nursing are as follows.

NUR 3101 Theoretical Foundations of Nursing 3 QH

Analyzes the development of the art and science of nursing. Includes systematic examination of major nursing theories and conceptual frameworks, elements of theory building, and theoretical frameworks from disciplines relevant to advanced nursing practice.

NUR 3102 Professional Issues in Nursing 3 QH

Addresses concepts basic to understanding the criteria for professionalism. Emphasizes ethical, legal, political, and economic issues that affect the individual practitioner, the profession, the client system, and the health care delivery system.

NUR 3103 Research Methods in Nursing 3 QH

Focuses on the relationship of research to knowledge and advanced nursing practice. Emphasizes the scientific process, formulating research problems, study designs, measuring variables, collecting data, and testing hypothesis. Requires students to develop preliminary research proposals. *Prereq.* Undergraduate statistics course that includes probability and hypothesis testing.

NUR 3104 Administrative Aspects of Nursing 3 QH

Emphasizes developing knowledge and skill in using theory to analyze organizational issues and roles in professional nursing. Focuses on organizational structure and process in relation to nursing service and health care delivery from various perspectives.

NUR 3105 Research Seminar 2 QH

Examines the essentials of research projects. Includes implementing survey methods, reliability and validity of norm-referenced and criterion-referenced measures, statistical applications, techniques in scaling, and data analysis. Provides opportunities for computer data processing and analysis and use of SPSS-X software. Requires the student to develop a research proposal. *Prereq.* NUR 3103.

NUR 3106 Advanced Pathophysiology 3 QH

Emphasizes complex pathophysiological concepts essential to the care of individuals with life-threatening

illness. Includes review of cellular physiology; physiologic dysfunction; physiologic adaptation to maintain the internal environment; and feedback and control mechanisms at the cellular, organ, and system levels of physiological functioning.

NUR 3107 Advanced Pharmacology 2 QH

Focuses on principles of pharmacology and the major drug classifications in relation to the treatment of health problems. Examines the effects of selected medications on pathophysiology and psychopathology.

NUR 3140 Curriculum Development in Nursing 3 QH

Focuses on curriculum development in nursing education. Includes history of nursing education, learning theories, criteria for programs in higher education, curriculum designs, testing and evaluation methods. Examines values, trends, and issues in contemporary nursing education.

NUR 3141 Teaching by Guided Design 3 QH

Provides experience in planning, implementing, and evaluating a teaching strategy in nursing education. Requires students to collaborate with course instructors and students to develop a guided design project that is implemented and evaluated in a baccalaureate nursing program. Seminars focus on preparing guided design projects, implementing strategies, and evaluating appropriately. Requires student teaching in a concurrent baccalaureate nursing course.

NUR 3142 Teaching Practicum 3 QH

Provides an individualized experience in practice teaching in a clinical or educational setting. Emphasizes teaching strategies, methods of learning reinforcement, and evaluation of teaching effectiveness. Examines faculty role and responsibilities. Requires students to implement and evaluate a teaching project or course, with assistance from a faculty preceptor. *Prereq.* Concurrent with NUR 3140.

Community Health Nursing

NUR 3200 Theoretical Foundations of Health 3 QH

Focuses on health, its theoretical development, and the health-illness continuum. Includes epidemiology, biostatistics, demography, environmental health, occupational health, and international health. Introduces issues in public health policy.

NUR 3201 Theories of Health Behavior 3 QH

Focuses on health, illness, sickness, and disability from nursing, sociological, psychological, cultural, and medical perspectives. Examines concepts, theories, and models that explain health-related behaviors. Explores the empirical foundation of interventions designed to promote health and prevent disease in individuals living in the community.

NUR 3202 Theories of Family Health 3 QH

Investigates theoretical bases for family nursing practice. Includes selected family frameworks developed by nursing and other disciplines. Reviews and evaluates research studies of family health and their application to health care of families in the community.

NUR 3203 Theories of Community Health Nursing 4 QH

Examines theoretical bases for identification and analysis of factors that promote or inhibit community health. Focuses on the development of strategies to meet health problems, and the role of nursing in community health care. *Prereq.* Concurrent NUR 3200, NUR 3201, or NUR 3202.

NUR 3204 Public Policy and Health Services Delivery 3QH
Focuses on relevant planning, regulatory, and economic policies. Considers application of policies to developing, implementing, and evaluating programs to meet the health care needs of high-risk populations.

NUR 3205 Decision Making in the Delivery of Home Health Services 3QH

Concentrates on relevant theories and their application to the decision-making processes which are the foundation of home health service delivery. Examines organizational, fiscal, and human resource factors.

NUR 3206 Case Management in Home Health Care 3QH
Addresses application of case management skills to various client developmental stages and health states. Includes reimbursement, legal, organizational, ethical, and research issues involved in providing home health care.

NUR 3211 Public Health Practicum 1 4QH
Provides a clinical learning experience to test the theoretical bases for community health nursing practice with individuals, families, and communities. Includes an individually negotiated field placement related to public health nursing and a weekly didactic seminar with faculty. *Prereq. Concurrent with NUR 3203 or NUR 3204.*

NUR 3212 Home Health Care Administration Practicum 1 4QH
Provides an administrative learning experience to test the theoretical bases for community health nursing practice. Involves negotiated field placement in a home health agency and a weekly didactic seminar with faculty. *Prereq. Concurrent with NUR 3203 or NUR 3205.*

NUR 3213 Home Health Clinical Practicum 1 4QH
Provides a clinical learning experience to test the theoretical bases for community health nursing practice with individuals, families, and communities. Includes an individually negotiated field placement in a home health agency and a weekly didactic seminar with faculty. *Prereq. Concurrent with NUR 3203 or NUR 3206.*

NUR 3214 Public Health Practicum 2 4QH
Provides a clinical learning experience integrating knowledge about role, management, organizational, and social behavior theories, and developing skills for advanced community health nursing practice. Includes a negotiated field placement related to public health and a weekly didactic seminar with faculty. *Prereq. NUR 3211.*

NUR 3215 Home Health Administration Practicum 2 4QH
Provides a clinical learning experience integrating knowledge about role, management, organizational, and social behavior theories. Develops skills for advanced community health nursing practice. Involves a negotiated field placement related to home health care administration and a weekly didactic seminar with faculty. *Prereq. NUR 3212.*

NUR 3216 Home Health Clinical Practicum 2 4QH
Provides a clinical learning experience integrating knowledge about role, management, organizational, and social behavior theories. Develops skills for advanced community health nursing practice. Involves a negotiated field placement related to home health care clinical specialty practice and a weekly didactic seminar with faculty. *Prereq. NUR 3213.*

NUR 3231 Research Advisement 2QH
Focuses on implementing the research project or thesis on community health nursing with assistance from faculty research advisers. Requires data collection, analysis, and presentation of research findings. *Prereq. NUR 3105.*

NUR 3241 Community Health Directed Study 3QH
Allows student to develop individualized plan to attain specific knowledge and skills related to professional goals. Consists of library study or reading, individual instruction, research, practicum, or other appropriate activity. *Prereq. Academic adviser's approval.*

Critical Care Nursing

NUR 3301 Critical Care Concepts 3QH
Explores the analysis and application of core behavioral, environmental, and psychosocial concepts essential to nursing care of individuals with critical health problems. Emphasizes critical evaluation of current nursing theory and research for potential application of findings in clinical practice. Includes opportunities to explore and develop concepts unique to each student's concentration area.

NUR 3302 Nursing Management of the Critically Ill 4QH
Emphasizes theoretical knowledge essential to understanding life-threatening pathophysiological problems, nursing diagnosis, and related management of critically ill individuals and their families. Includes current

theories and research from nursing, and physical and behavioral sciences as a basis for clinical decision making. Uses the frameworks of the nursing process and the lifecycle to present course content. *Prereq. NUR 3106 or equiv.*

NUR 3303 Nursing Management of the Critically Ill 2 3QH
Continues the discussion of theories essential to understanding life-threatening pathophysiological problems, nursing diagnosis, and related management of the critically ill and their families. Includes current theories and research from nursing and physical and behavioral sciences as a basis for clinical decision making. Considers models of nursing care delivery and ethical and legal issues related to critical care. *Prereq. Concurrent with NUR 3107 or NUR 3302.*

NUR 3304 Role Development Seminar 3 QH
Explores the role of the clinical nurse specialist. Focuses on collaboration and change strategies in various practice settings. Includes consultation, education, liaison, supervision, peer review and referral. *Prereq.* Concurrent with NUR 3312.

NUR 3311 Critical Care Nursing Practicum 1 4 QH
Provides a clinical learning experience in a concentration area of critical care nursing. Utilizes a variety of clinical settings and skilled agency preceptors to meet students' individual learning needs. Includes a weekly didactic seminar with faculty. *Prereq.* Concurrent with NUR 3302.

NUR 3312 Critical Care Nursing Practicum 2 4 QH
Continues learning experience in an individually negotiated clinical setting. Utilizes the clinical, managerial, or teaching role of the clinical specialist in critical care nursing. Includes a weekly didactic seminar with faculty. *Prereq.* Concurrent NUR 3304 or NUR 3311.

NUR 3313 Critical Care Nursing Practicum 3 4 QH
Provides intensive clinical learning experience in a concentration area of critical care nursing. Focuses on implementing the student's chosen functional role. Includes a weekly didactic seminar with faculty. *Prereq.* NUR 3312.

NUR 3331 Research Advisement 2 QH
Focuses on implementing the research project or thesis on critical care nursing with assistance from faculty research advisers. Requires data collection, analysis, and presentation of research findings. *Prereq.* NUR 3105.

NUR 3341 Critical Care Directed Study 3 QH
Allows student to develop individualized plan to attain specific knowledge and skills related to professional goals. Consists of library study or reading, individual instruction, research, practicum, or other appropriate activity. *Prereq.* Academic adviser's approval.

Primary Care Nursing

NUR 3401 Primary Care of Well Children 3 QH
Focuses on assessing newborns, healthy children, and their families, and on issues pertinent to normal development. Includes a framework for anticipatory guidance and assessing development at various ages and stages of childhood; general guidelines for routine health care maintenance; screening, and immunizations; and discussion of common health problems encountered in a pediatric primary care setting. *Prereq.* Concurrent with NUR 3106.

NUR 3402 Primary Care of Child Health Problems 4 QH
Develops cognitive and affective competencies necessary for performing successfully as primary care nurses. Focuses on assessment, diagnosis and management of children with minor acute and stabilized chronic illnesses. Emphasizes the advanced nursing practice role and developing collaboration, consultation, and referral skills. *Prereq.* NUR 3401; concurrent NUR 3107.

NUR 3403 Primary Care of Well Adults 3 QH
Provides an overview of health promotion as an integral aspect of adult health within the primary care context. Includes the impact of ecological, psychological, sociological, and physiological factors on human health. Examines adult development as a framework to assess health needs and formulate intervention strategies for individuals and families. Reviews nursing issues related to integrating these techniques into the advanced practice role. *Prereq.* concurrent NUR 3106.

NUR 3404 Primary Care of Adult Health Problems 4 QH
Develops cognitive and affective competencies necessary for performing successfully as primary care nurses. Focuses on assessment, diagnosis and management of adults with minor acute and stabilized chronic illnesses. Emphasizes the advanced nursing practice

role and developing collaboration, consultation, and referral skills. *Prereq.* NUR 3403 concurrent NUR 3107.

NUR 3405 Primary Care of Adolescents/Young Adult Health Problems 4 QH
Builds on the cognitive and affective skills developed in NUR 3402 or NUR 3404. Focuses on common health problems of adolescents and young adults, emphasizing the reproductive system. Considers client's health risks and health behavior including cultural factors, health promotion, and application of individual, developmental, and family dynamic frameworks. Incorporates anatomy, physiology, pathophysiology and pharmacology. *Prereq.* NUR 3402 or NUR 3404.

NUR 3406 Primary Care of Well Older Adults 3 QH
Provides an overview of the normal aging process and physiology of older adults. Uses frameworks of healthy aging to assess health needs and formulate intervention strategies for older adults and families. Emphasizes health promotion and disease prevention. Reviews practice issues related to integrating these techniques into the advanced nursing practice role. *Prereq.* concurrent NUR 3106.

NUR 3407 Primary Care of Older Adult with Health Problems 1 4 QH
Discusses assessing, promoting, and maintaining health and function of the elderly in long-term care institutions. Includes advanced assessment techniques appropriate for the elderly; pathophysiology of aging; pathophysiology of acute and chronic disease; pharmacology; treatment of acute and chronic medical and psychiatric illness; counseling techniques, and strategies for evaluation and follow-up. Discusses quality assurance, interdisciplinary teaming, and current policies and trends affecting long-term health care. *Prereq.* NUR 3406 concurrent NUR 3107.

NUR 3408 Primary Care of Older Adult Health Problems 2**4 QH**

Focuses on assessing, promoting, and maintaining health and function of the older adult with health problems living in the community. Emphasizes analysis of research relating to social support systems and individual psychological coping, with the goal of defining nursing interventions to improve functions and well-being of the elderly and their families. Addresses ethical dilemmas and the effect of cultural expectations on health care. *Prereq.* NUR 3407.

NUR 3409 Role Development Seminar**3 QH**

Explores the role of the clinical nurse specialist and nurse practitioner. Focuses on using collaboration and change strategies in various practice settings. Includes consultation, education, liaison, supervision, peer review and referral. Students meet together for seminar and are assigned to integrated specialty groups to focus on issues related to advanced practice in nursing. *Prereq.* concurrent NUR 3402, NUR 3404 or NUR 3407.

Provides a clinical learning experience in primary care nursing with children in ambulatory settings that correlates with NUR 3401. Uses a holistic approach to assess the child and family. Emphasizes identification of families or individuals at risk for health problems, as well as health promotion and health maintenance. Involves an individually negotiated clinical placement with agency preceptors and a weekly didactic seminar with faculty. *Prereq.* Concurrent with NUR 3401.

NUR 3412 Primary Care of Children Practicum 2**4 QH**

Provides a clinical learning experience emphasizing delivery and coordination of primary care nursing services for children and their families. Focuses on assessment, diagnosis and management of stable chronic conditions and episodic acute illnesses commonly encountered in children. Builds on a foundation of practice behaviors in health assessment, health promotion, and disease prevention. Involves an individually negotiated clinical placement with agency preceptors and a weekly didactic seminar with faculty. *Prereq.* Concurrent with NUR 3402 and NUR 3411.

NUR 3413 Primary Care of Adolescents/Young Adults Practicum 3**4 QH**

Builds on clinical experience in NUR 3412 and NUR 3415. Provides experience in two clinical sites focusing on reproductive health care and adolescent/young adult health problems. Discusses women's health issues and adolescent problems. Explores developing and negotiating roles and relationships within the health care team. Includes a weekly didactic seminar. *Prereq.* Concurrent with NUR 3405, NUR 3412 or NUR 3415.

NUR 3414 Primary Care of Adults Practicum 1**3 QH**

Provides a clinical learning experience in primary care nursing with adults in ambulatory settings. Uses a holistic approach to assess the adult and family. Emphasizes identification of individuals at risk for health problems, as well as health promotion and health maintenance. Involves an individually negotiated

clinical placement with agency preceptors and a weekly didactic seminar with faculty. *Prereq.* Concurrent with NUR 3403.

NUR 3415 Primary Care of Adults Practicum 2**4 QH**

Provides a clinical learning experience which emphasizing delivery and coordination of primary care nursing services for adults and their families. Focuses on assessment, diagnosis and management of stable chronic conditions and episodic acute illnesses commonly encountered in adults. Builds on a foundation of practice behaviors in health assessment, health promotion and disease prevention. Involves an individually negotiated clinical placement with agency preceptors and a weekly didactic seminar with faculty. *Prereq.* Concurrent with NUR 3404 and NUR 3414.

NUR 3416 Primary Care of Adults Practicum 3**4 QH**

Builds on the clinical learning experience of previous primary care nursing courses. Focuses on women's health and reproductive functions, as well as factors related to aging. Involves a weekly didactic seminar that examines problems related to women's health care and developmental changes associated with aging. *Prereq.* NUR 3415 and concurrent with NUR 3405.

NUR 3417 Primary Care of Older Adults Practicum 1 3 QH

Provides a clinical learning experience in primary care nursing with older adults in a variety of settings. Uses a holistic approach to assess the older adult and family. Emphasizes the identification of individuals and families at risk for health problems, as well as health promotion and maintenance. Involves an individually negotiated clinical placement with agency preceptors and a weekly didactic seminar with faculty. *Prereq.* NUR 3418 and concurrent with NUR 3406.

NUR 3418 Primary Care of Older Adults Practicum 2 4 QH

Provides a clinical learning experience in caring for older adults in long-term care facilities. Defines practice skills to optimize function, health, and well-being by managing health problems and supporting psychological coping skills in the elderly. Analyzes organizational behavior principles that affect the primary care nurse's role in advanced practice. Involves a weekly didactic seminar with faculty. *Prereq.* NUR 3417 or concurrent with NUR 3407.

NUR 3419 Primary Care of Older Adults Practicum 3 4 QH

Provides a clinical learning experience in caring for older adults in the community. Refines practice skills and emphasizes interventions in social support systems and psychological coping for the elderly. Addresses the primary care nurse's role in caring for impaired older adults living in the community. Involves a weekly didactic seminar with faculty. *Prereq.* NUR 3418 or concurrent with NUR 3408.

NUR 3420 Rural Health Care**4 QH**

Provides a concentrated, individually negotiated, clinical learning experience in a rural health area for one month with supervision by an onsite preceptor. Focuses on assessing the community and developing a community health education program. Includes practice of

primary care nursing skills with individuals and families. Requires students to present their rural health experience in a seminar upon completion of the course. *Prereq.* *Permission of the instructor.*

NUR 3431 Research Advisement 2 QH
Focuses on implementing the research project or thesis on primary care nursing with assistance from faculty research advisers. Requires data collection, analysis, and presentation of research findings. *Prereq.* *NUR 3105.*

NUR 3441 Primary Care Directed Study 3 QH
Allows student to develop an individualized plan to attain specific knowledge and skills related to professional goals. Consists of library study or reading, individual instruction, research, practicum, or other appropriate activity. *Prereq.* *Academic adviser's approval.*

Psychiatric-Mental Health Nursing

NUR 3501 Human Behavior: Personality 3 QH
Focuses on the psychological structure, development, and functioning of the individual. Examines personality development as a progression of stages of growth facilitated or delayed by interpersonal and sociocultural factors. Explores basic theoretical concepts within various framework from the psychoanalytic to the feminist. Examines literature from other disciplines relevant to psychiatric nursing practice.

NUR 3502 Human Behavior: Family Systems 3 QH
Introduces family dynamics, therapy, and research. Focuses on psychodynamics of the family, interaction and communication process, family structure and organization, family dysfunction, and therapy practices. Uses family case studies and clinical media to demonstrate ways to observe, describe, analyze, and intervene in family-focused treatment situation. Reviews and evaluates research approaches to study of the family. *Prereq.* *NUR 3501 or equiv.*

NUR 3503 Dimensions of Community Mental Health 3 QH
Focuses on broad issues of community mental health, systems, and factors that influence services to diverse populations. Addresses the fundamentals of group process related to target populations in community mental health settings. Emphasizes interdisciplinary approaches to planning community services and designing prevention programs. Includes historical, political, economic, cultural, and professional issues relevant to the community mental health movement and the role of the psychiatric clinical nurse specialist in this area. *Prereq.* *NUR 3502 or equiv.*

NUR 3504 Psychopathology of Childhood 3 QH
Emphasizes psychopathological disorders throughout the developmental phases of infancy, early childhood, and latency. Focuses on diagnostic process and treatment planning for nursing intervention. Uses a psychoanalytic model primarily, but also discusses interactional, behavioral, and neurological models related to assessment, treatment, and prevention. Considers therapeutic work with parents. *Prereq.* *Concurrent with NUR 3501 or equiv.*

NUR 3505 Mental Health Problems of Adolescents 3 QH
Focuses on therapeutic management of adolescent health problems. Topics include assessment and adolescent suicide, self-destructive behavior, incest, drug

and alcohol abuse, acting-out behavior, psychosis, and violence. Explores psychodynamic concepts, psychiatric referral process, and issues related to treatment and placement in the community. *Prereq.* *NUR 3501 or equiv.*

NUR 3506 Role Development Seminar 3 QH
Explores the role of the clinical nurse specialist. Focuses on the use of collaboration and change strategies in various practice settings. Includes consultation, education, liaison, supervision, peer review, and referral. *Prereq.* *Concurrent with NUR 3503.*

NUR 3511 Psychiatric Nursing Practicum 1 4 QH
Provides clinical experiences with adults or children and adolescents in psychiatric settings. Investigates techniques of observing, communicating, and interviewing in assessing individuals. Surveys basic psychopathology, differential diagnosis, psychopharmacology, and treatment planning within various psychodynamic formulations in a weekly didactic seminar with faculty. Students develop a caseload of selected clients and practice two days per week in a negotiated placement with an agency preceptor. *Prereq.* *Concurrent with NUR 3501.*

NUR 3512 Psychiatric Nursing Practicum 2 4 QH
Provides clinical experiences with adults or children and adolescents in psychiatric settings. Focuses on planning care, psychiatric treatment modalities, and management issues. Explores therapeutic approaches pertinent to selected psychiatric disorders from the DSM-III-R, emergency intervention, and crisis intervention. Uses case material from students continuing practice in agency as basis for discussion in weekly didactic seminar with faculty. *Prereq.* *NUR 3511 and concurrent with NUR 3502.*

NUR 3513 Psychiatric Nursing Practicum 3 4 QH
Provides clinical experiences with individuals, groups, and families in psychiatric and community settings. Focuses on direct and indirect care, with an increasing emphasis on community involvement in treating mental health problems. Requires assessing a particular community to identify a mental health problem and begin planning a community program. Discusses case studies, interdisciplinary collaboration issues, and intervention strategies from a community mental health perspective in the weekly didactic seminar with faculty. *Prereq.* *NUR 3512 and concurrent with NUR 3503.*

NUR 3514 Psychiatric Nursing Practicum 4 4 QH

Provides a clinical learning experience with groups, families, and organizations in psychiatric and community settings. Requires students to implement and evaluate a community project. Focuses on promotion of mental health and levels of prevention; synthesis of therapeutic techniques in working with complex systems; group process and termination issues related to work with clients, agency, professionals, faculty and student colleagues; and evaluation of clients' progress and students' accomplishments in weekly didactic seminar with faculty. *Prereq.* NUR 3513.

NUR 3520 Crisis Theory and Intervention 3 QH

Addresses crisis theory, practice, and research issues. Reviews and critiques crisis literature. Refines crisis intervention skills and stimulates theory and research development in the crisis intervention field. Includes lectures and discussion of crisis situations from the literature, personal and professional experience and films. Open to graduate students in nursing, criminal justice, applied sciences, and health professions.

NUR 3521 Alcoholism: Assessment and Early Intervention 3 QH

Explores theories and issues related to alcoholism and other addictions. Focuses on skills necessary to assess

addictive behavior including taking a client's drug history, working with denial, and making appropriate referrals. Assignments include taking a drinking/drug history and attending a self-help group in the community. Discusses therapeutic issues relevant to professionals in general health care settings.

NUR 3522 Elective Practicum 1 QH

Provides an individualized field experience in an appropriate agency or community setting. Focuses on a selected client population to allow students to observe and practice specific therapeutic skills supervised by the course instructor. *Prereq.* *Permission of the instructor.*

NUR 3531 Research Advisement 2 QH

Focuses on implementing the research project or thesis on psychiatric-mental health nursing with assistance from faculty research advisers. Requires data collection, analysis, and presentation of research findings. *Prereq.* NUR 3105.

NUR 3541 Psychiatric-Mental Health Directed Study 3 QH

Allows student to develop an individualized plan to attain specific knowledge and skills related to professional goals. Consists of library study or reading, individual instruction, research, practicum, or other appropriate activity. *Prereq.* *Academic adviser's approval.*

Nursing Administration

NUR 3601 Nursing Administration 1: Health Care Organizations 3 QH

Analyzes administrative theories to prepare student for nursing administration in various health care settings. Focuses on structure, objectives, and policies of health care organizations. Examines the influence of outside groups, health insurers, government, and special interest groups on delivery of health care services. *Prereq.* *Concurrent* NUR 3104.

NUR 3602 Nursing Administration 2: Finances and Information Systems 3 QH

Presents a theoretical foundation to use and analyze management information systems. Emphasizes the decision making process of fiscal management and allocation of resources. Considers staffing, patient classification systems, reimbursement policies, costing services, and budgeting/fiscal management from entry- to middle-level nursing administrator's perspective. Requires computer exercises with spreadsheets and database management programs. *Prereq.* *Concurrent* NUR 3601.

NUR 3603 Nursing Administration 3: Humane Resource Management 3 QH

Focuses on professional personnel development and management. Examines department organization, staff development, change, collective bargaining, and quality assurance within the nursing administrator's scope of responsibility. Explores concepts of interper-

sonal relationships, group dynamics, and consultation to enhance administrative skills. *Prereq.* *Concurrent* NUR 3602.

NUR 3604 Role Development Seminar 3 QH

Explores the role of the clinical nurse specialist. Focuses on the use of collaboration and change strategies in various practice settings. Includes consultation, education, liaison, supervision, peer review, and referral. Students meet together for seminar and are assigned to integrated specialty groups to focus on issues related to advanced practice in nursing. *Prereq.* *Concurrent* NUR 3603.

NUR 3611 Nursing Administration Practicum 1 4 QH

Provides an administrative learning experience in a clinical setting with a nursing administrator as preceptor. Applies theory through observing, participating in, and researching organizational functioning and nursing leadership. Focuses on departmental structure and issues related to the role of the nursing administrator in a weekly didactic seminar with faculty. *Prereq.* *Concurrent* NUR 3104 or NUR 3601.

NUR 3612 Nursing Administration Practicum 2 4 QH

Provides an administrative learning experience in a clinical setting with a nursing administrator as preceptor. Applies theory through observing, participating in, and researching organizational functioning and nursing leadership. Focuses on management and leadership

functions and issues related to the role of the nursing administrator in a weekly didactic seminar with faculty. *Prereq. Concurrent NUR 3602 or NUR 3611.*

NUR 3613 Nursing Administration Practicum 3 4 QH

Provides an administrative learning experience in a clinical setting with a nursing administrator as preceptor. Applies theory through observing, participating in, and researching organizational functioning and nursing leadership. Focuses on communicating and implementing the role of the nursing administrator in a weekly didactic seminar with faculty. *Prereq. Concurrent NUR 3603 or NUR 3612.*

NUR 3620 Nurse Entrepreneur 3 QH

Provides the theoretical foundation for planning and operating a business from the perspective of the nurse entrepreneur. Identifies strategies for achieving business goals. Emphasizes development of a winning business plan through a step-by-step approach with a strong focus on marketing, planning, and financial analysis.

NUR 3631 Research Advisement 2 QH

Focuses on implementing the research project or thesis on nursing administration with assistance from faculty research advisers. Requires data collection and analysis and presentation of research findings. *Prereq. NUR 3105.*

NUR 3641 Nursing Administration Directed Study 3QH

Allows student to develop individualized plan to attain specific knowledge and skills related to professional goals. Consists of library study or reading, individual instruction, research, practicum, or other appropriate activity. *Prereq. Academic adviser's approval.*

Graduate School of Pharmacy and Allied Health Professions

INT 3101 Biochemistry 1**2 QH**

Offers a description of the biochemical components of the cell including carbohydrates, lipids, prostaglandins, steroid hormones, amino acids, polypeptides, proteins, purines, pyrimidines, nucleosides, nucleic acids, and vitamins. Considers buffers, Henderson-Hasselbalch equation, and the importance of pKa. *Prereq.* One year of organic chemistry.

INT 3102 Biochemistry 2**2 QH**

Discusses enzymes, enzyme kinetics, and mechanisms of enzyme reactions, of intermediary metabolism and of biological oxidation-reduction reactions, bioenergetics, and the electron transport chain. Considers carbohydrate metabolism including the glycolytic pathway, the citric acid cycle, and the pentose phosphate pathway. *Prereq.* INT 3101.

INT 3103 Biochemistry 3**2 QH**

Presents lipid metabolism, including the fatty acid cycle, the biosynthesis of fatty acids, and the biological formation of the prostaglandins, cholesterol, and steroid hormones. Studies the metabolism of the various amino acids, including the urea cycle, one-carbon fragments, transamination reactions, and aromatic hydroxylations. Discusses metabolism of nucleic acids and their building blocks, as well as the genetic basis of protein synthesis, the genetic code, and the mechanisms of control. *Prereq.* INT 3102.

INT 3201 Applications of Mass Spectrometry**2 QH**

Examines the principles governing the fragmentation and ionization of organic molecules, the interpretation of mass spectra, and applications of mass spectrometry to the solution of selected problems in the fields of chemistry, biochemistry, and forensic sciences. *Prereq.* One year of organic chemistry, basic physics, physical organic chemistry desirable but not essential.

MHP 3101 Health Care Delivery**3 QH**

Explores the principal components of the health care delivery system with an emphasis on its social, political, and economic evolution and development. Discusses future trends and their implications.

MHP 3102 Health Research Methodology**3 QH**

Covers aspects of experimental design and hypothesis testing. Uses critical reading of clinical trials, cohort and retrospective studies, and health services research articles to illustrate principles of research design and conduct. Students will be expected to complete a research protocol. *Prereq.* MHP 3101.

MHP 3103 Professional Dynamics in Health Care**3 QH**

Examines skills and techniques used in developing leadership attributes, in creating change, and in working effectively with individuals and groups in the health care environment. Emphasizes differing, successful approaches for both leadership and interaction in the ambulatory, institutional, professional, legislative, and regulatory health care setting. *Prereq.* MHP 3101 and MHP 3102.

MHP 3111 Operations Management in Health Care**3 QH**

Studies the application of systems analysis to health care institutions with particular attention to concepts

for the management of ancillary services departments. Uses case studies to analyze work sampling, work flow, systems design, materials management, supply utilization, human resource management, and productivity improvements. Requires course project.

MHP 3112 Financial Analysis in Health Care**3 QH**

Focuses on the application of financial analytic principles to health care institutions with particular attention to concepts for the management of ancillary services departments. Uses case studies and hospital financial reports to develop such techniques as cost accounting and budgeting. Emphasizes practical use of financial techniques for analyzing alternatives and decision making, as well as functional knowledge of financial management in health care. *Prereq.* MHP 3111.

MHP 3200 Fundamentals of Regulatory Risk Assessment**3 QH**

Applies toxicologic, statistical, and pharmacokinetic principles to assessing the impact on health of hazardous exposure to chemical carcinogens and noncarcinogens found in the environment. Focuses on mathematical methods for quantitative risk assessment, exposure assessment, and risk characterization. Includes lab exercises and term paper assignments for in depth review of the key processes in risk assessment. Uses major risk assessments as examples such as dioxin, ozone, benzene, and ethylene dibromide.

MHP 3201 Biometrics**2 QH**

Explores the fundamental principles of experimental design and statistical analysis, emphasizing biomedical research. Topics include descriptive statistics, hypothesis testing, correlation, regression, and chi-square test.

MHP 3221 Health Science Education 1**3 QH**

Offers an overview of various aspects of education in the health-related professions, including design and use of behavioral objectives, evaluation tools (both clinical and didactic), and a survey of various teaching methods. Discusses current journal literature.

MHP 3222 Health Science Education 2**3 QH**

Examines various packages of self-instructional aids. With the aid of lecture material and independent assignments, each student will design and produce a fifteen-minute autotutorial and will present it to the class for critique. Current journal literature will also be used.

MHP 3401 Health Policy Analysis and Evaluation**3 QH**

Presents the application of analytic techniques (for example, decision analysis, benefit-cost analysis, cost-effectiveness analysis) to the forming, implementing, and evaluating of health policies and health care programs. Analysis of past and present studies in allocation of health care resources will examine the analytic as well as the political basis for decisions. Students critique published case analyses in class. A written analysis of a future proposal or current program is required. *Prereq.* MHP 3101, MHP 3102, or equiv.

- MHP 3402 Health Policy Seminar 1** 1 QH
Analyzes a selected topic from health policy literature. Students will be expected to evaluate and critique published articles and lead a seminar session. *Prereq.* MHP 3101 and MHP 3102.
- MHP 3403 Health Policy Seminar 2** 1 QH
Continues MHP 3402.
- MHP 3404 Health Policy Seminar 3** 1 QH
Continues MHP 3403.
- MHP 3801 MHP Thesis** 2 QH
Student may register three times for a total of 6 QH of credit. *Prereq.* Written permission.
- MHP 3802 MHP Research Report** 2 QH
Student may register for this course three times for a total of 6 quarter hours of credit. *Prereq.* Written permission.
- MHP 3810 MHP Directed Study** 3 QH
Offers directed research in health studies. Research and study under the direction of a faculty member. *Prereq.* Written permission.
- MLS 3301 Functions of the Human Systems** 2 QH
Examines physiology of the nervous, endocrine, muscular, cardiovascular, respiratory, urogenital, and digestive systems. *Prereq.* Chemistry and biology.
- MLS 3302 Pathophysiology 1** 2 QH
Considers disease processes as appropriate and inappropriate variants of normal physiological functions. Examines certain important and illustrative diseases rather than a survey or catalog of diseases in general. *Prereq.* Mammalian physiology; knowledge of biochemistry is helpful.
- MLS 3303 Pathophysiology 2** 2 QH
Continues MLS 3302. *Prereq.* MLS 3302.
- MLS 3304 Cellular Pathology** 3 QH
Investigates cell aging and cell death mechanisms; reactions of cells to injury; the effects of ischemia, oxides of nitrogen, ozone, carbon tetrachloride, mercury, cadmium; immune injury; and theories of carcinogenesis. Lectures are based on recent review and current research articles. *Prereq.* Chemistry, biology; biochemistry, and cell biology helpful.
- MLS 3310 Principles of Medical Endocrinology** 2 QH
Studies endocrine-related clinical abnormalities emphasizing the relationship of clinical lab measurement to biochemical dysfunctions of the endocrine system. *Prereq.* Biochemistry.
- MLS 3313 AIDS** 2 QH
Offers an exploration of clinical, immunological, virological, epidemiological, and social facets of AIDS. Includes an introductory exposition of the present state of the disease and several sessions critically dissecting the pertinent literature.
- MLS 3321 Hematology 1—Disorders of the Erythrocytes** 2 QH
Examines the physiology and pathology of red blood cells and hemoglobin. *Prereq.* Some knowledge of basic hematology is essential, and familiarity with general mammalian biochemistry is strongly recommended.
- MLS 3322 Hematology 2—Disorders of the Leukocytes** 2 QH
Explores the pathophysiology of white cell disorders. Discusses clinical and lab correlations of leukemias, myeloproliferative, and lymphoproliferative disorders, infections, and inherited leukocyte anomalies. *Prereq.* Undergraduate biochemistry.
- MLS 3323 Hematology 3—Hemostasis** 2 QH
Presents clinical and lab correlations of hemostatic disorders. Covers material from the basic to the most recent experimentation, technical, and clinical applications. *Prereq.* Undergraduate biochemistry, hematology course, or experience.
- MLS 3331 Genetic and Immunologic Aspects of Blood Group Identification** 1 QH
Offers lectures dealing with immune response, physical chemistry of immunohematological tests, immunological diseases, tests for detection and identification of antibodies and antigens, principles of human genetics, blood group genetics, and population and family studies. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq.* MLS 1631 and permission of instructor.
- MLS 3332 Principles and Foundations of the Blood Group Systems** 2 QH
Presents lectures and experience with the human blood group systems, their antigens and antibodies, genetic inheritance and interactions, frequencies, mutants and alterations by disease states, and blood group testing. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq.* MLS 3331, MLS 3531, and permission of instructor.
- MLS 3333 Design and Problems of Compatibility Testing** 1 QH
Includes lectures and experience with the design and purpose of compatibility testing; factors complicating compatibility procedure; techniques employed in compatibility testing; leukocyte, platelet, and tissue compatibility; and special crossmatch and transfusion procedures. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq.* MLS 3331, MLS 3531, MLS 3332, MLS 3532, and permission of instructor.
- MLS 3334 Principles of Hematology and Coagulation Related to Transfusion** 3 QH
Offers lectures and lab experience related to hemoglobins; iron metabolism; blood formation; blood volume functions of circulating cells; anemias; leukemias and lymphomas; coagulation theories, factors, and disorders. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq.* Permission of instructor.
- MLS 3335 Transfusion Therapy** 2 QH
Presents lectures discussing the selection of blood donors, phlebotomy and pheresis procedures, processing requirements, donor reaction, blood components, and physical characteristics of stored blood. Topics

include indications for transfusion, transfusion reaction, therapeutic phlebotomy and pheresis, autologous transfusions, pediatric transfusions, massive blood replacement, extracorporeal perfusion, cardiopulmonary bypass, and dialysis. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq.* *MLS 1631 and permission of instructor.*

MLS 3336 Immunoematology Administration 2 QH

Offers lectures and experience dealing with standards for blood banks and transfusion services (federal, state, AABB); requirements for state, FDA, and NIH (BOB) licensing; the American Blood Commission; and inspection and accreditation donor procurement. Considers interbank blood exchange; organization of blood bank and transfusion service; medical and legal aspects of transfusion practice; design of physical facilities; and evaluation, selection, and maintenance of equipment. Other topics include evaluation and selection of supplies and reagents; preparation; labeling requirements; quality control systems; proficiency testing programs; record keeping; computer principles, use of computer facilities; and operations of donor facilities and blood bank labs. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq.* *MLS 1631 and permission of instructor.*

MLS 3338 Immunobiology 2 QH

Presents topics of current interest in immunobiology, such as cell interactions in the immune response, the major histocompatibility complex, antibody structure and function and the regulation of the immune response. *Prereq.* *Permission of instructor.*

MLS 3339 Immunopathology 2 QH

Presents the basic elements of immunopathology. Reviews the components and function of the immune system. Covers the disorders of the complement system, the biologic mechanisms of immunologically induced tissue injury (hypersensitivity reactions), autoimmunity, and immunodeficiency. Considers the immunological features of cancer and transplant rejection. *Prereq.* *MLS 3338.*

MLS 3341 Medical Bacteriology 3 QH

Focuses on those aspects of clinical bacteriology that are of significance in understanding the interaction among the infecting organism, the host and host defenses that affect symptoms, diagnosis, and chemotherapy of bacterial disease. *Prereq.* *Undergraduate microbiology.*

MLS 3342 Current Topics in Microbiology 3 QH

Emphasizes current topics in infectious diseases. Discusses topics in microbiology that are of medical and epidemiological interest during the time the course is being offered. *Prereq.* *Undergraduate microbiology and immunology.*

MLS 3343 Medical Virology 3 QH

Focuses on those aspects of clinical virology that are significant in understanding the interaction among infecting viruses, the host and host defenses that affect symptoms, diagnosis, and therapy of viral disease.

Prereq. *Undergraduate microbiology and immunology.*

MLS 3345 Epidemiology 2 QH

Studies the basic concepts of epidemiology, causes of disease, factors contributed by agents, the human host, and the environment. Examines the acquisition and evaluation of data, as well as the relationship of person, time, and place. Reviews case studies and problems, including diet and cancer, causes of heart disease, and a review of the AIDS epidemic. *Prereq.* *Permission of instructor.*

MLS 3351 Interpretive Clinical Chemistry 2 QH

Presents the basic concepts in lab investigations; diagnostic enzymology, immunology, and clinical toxicology; organ system diseases; metabolic diseases; and special topics such as pediatric clinical biochemistry and cancer-associated biochemical abnormalities. *Prereq.* *INT 3101, INT 3102, INT 3103, undergraduate clinical chemistry, analytical and organic chemistry, and medical physiology.*

MLS 3352 Clinical Chemistry Techniques and Instrumentation 2 QH

Discusses the current analytical techniques and instrumentation used in clinical and research labs. Emphasizes developing a thorough understanding of the principles of these techniques and instrumentation. Covers applications to specific analyses and instrument troubleshooting. *Prereq.* *INT 3101, INT 3102, INT 3103, MLS 3354 undergraduate clinical chemistry, analytical and organic chemistry, and medical physiology.*

MLS 3353 Clinical Chemistry Quality Assurance 2 QH

Discusses statistical procedures; establishing and using reference ranges; analyzing goals and clinical relevance of lab procedures; evaluating methods; quality assurance; and sources of biological variation. *Prereq.* *MLS 3352 and biostatistics.*

MLS 3354 Biomedical Analysis 2 QH

Presents the modern reagents and techniques important in purifying and detecting biomolecules. Examples of reagents are radioisotopes, lumiphores, fluorophores, enzymes, electrophores, monoclonal antibodies, DNA probes, protein A, avidin-biotin, and detergents. Examples of techniques are chromatography, including GC and HPLC, radioenzymatic assays, 2D-electrophoresis, immunoassays, blotting assays, and mass spectrometry. *Prereq.* *INT 3101, INT 3102, and INT 3103.*

MLS 3355, MLS 3356 Seminar and Report in Clinical Chemistry 1, 2 2 QH

Offers reports and discussions of current journal articles in clinical chemistry. *Prereq.* *PMC 3301.*

MLS 3365 Medical Laboratory Management 1 3 QH

Provides an opportunity for medical technologists to prepare themselves for managerial responsibilities. Introduces the basic skills and knowledge appropriate to the administration of a medical lab rather than specialized functional techniques. The basic objectives of the concentration are: to confront the student with

appropriate learning experiences; to increase skills and knowledge in basic disciplines underlying administrative practice; and to develop judgment and skills in problem analysis and decision making in organizations. Discusses supervision, operations, organizations, productivity, human behavior, communications, and personnel management. *Prereq.* Medical lab experience or permission of instructor.

MLS 3531 Genetic and Immunologic Aspects of Blood Group Identification Laboratory 1 QH

Offers lab experience with immune response, physical chemistry of immunohematological tests, immunological diseases, tests for detection and identification of antibodies and antigens, principles of human genetics, blood group genetics, and population and family studies. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq.* MLS 1631 and permission of instructor.

MLS 3532 Principles and Foundations of the Blood Group Systems Laboratory 2 QH

Offers lab experience with human blood systems, antigens and antibodies, genetic inheritance and interactions, frequencies, mutants and alterations by disease states, and blood group testing. Conducted at the New Deaconess Hospital Blood Bank Training Center. *Prereq.* MLS 3331, MLS 3531, and permission of instructor.

MLS 3533 Design and Problems of Compatibility Testing Laboratory 2 QH

Presents lab experience with the design and purpose of compatibility testing; factors complicating compatibility procedures; techniques employed in compatibility testing; leukocyte, platelet and tissue compatibility; and special crossmatch and transfusion procedures. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq.* MLS 3331, MLS 3531, MLS 3332, MLS 3532, and permission of instructor.

MLS 3535 Transfusion Therapy Laboratory 2 QH

Provides lab experience with selection of blood donors, phlebotomy and pheresis procedures, processing requirements, donor reaction, blood components, and physical characteristics of stored blood. Topics include indications for transfusion, transfusion reactions, therapeutic phlebotomy and pheresis, autologous transfusions, cardiopulmonary bypass, and dialysis. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq.* MLS 1631 and permission of instructor.

MLS 3536 Immunohematology Administration Laboratory 2 QH

Offers lab experience with standards for blood banks and transfusion services (federal, state, AABB); requirements for state, FDA, and NIH (BOB) licensing; the American Blood Commission; inspection and accreditation donor procurement; and interbank blood exchange. Topics include organization of blood bank and transfusion service; medical and legal aspects of transfusion practice; design and physical facilities; evaluation, selection, and maintenance of equipment;

evaluation and selection of supplies and reagents; preparation; labeling requirements; quality control systems; proficiency testing programs; record keeping; computer principles, and the use of computer facilities; operations of donor facilities; and blood bank labs. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq.* MLS 1631 and permission of instructor.

MLS 3538 Immunobiology Laboratory 2 QH

Students are required to undertake individual research projects relating to topics covered in lecture.

MLS 3602 Blood Banking—MLS Seminar 1 QH

Revolving topics.

MLS 3603 Clinical Chemistry—MLS Seminar 1 QH

Discusses current research.

MLS 3604 Hematology—MLS Seminar 1 QH

Revolving topics.

MLS 3605 Immunology—MLS Seminar 1 QH

Revolving topics.

MLS 3606 Management—MLS Seminar 1 QH

Revolving topics.

MLS 3607 Microbiology—MLS Seminar 1 QH

Revolving topics.

MLS 3608 Education—MLS Seminar 1 QH

Revolving topics. *Prereq.* MLS 3221 and MLS 3222, or permission.

MLS 3609 Immunohematology—MLS Seminar 1 QH

Revolving topics.

MLS 3801 Graduate Research Report 1 2 QH

Studies a special topic in medical lab science, involving individual research, undertaken and reported under the direction of a faculty member. *Prereq.* Written permission of instructor.

MLS 3802 Graduate Research Report 2 2 QH

Students may register twice (4 QH). Continues MLS 3801. *Prereq.* MLS 3801.

MLS 3821 MLS Thesis 2 QH

Involves analytical or experimental work conducted under the auspices of the department. Students may register three times (6 QH). *Prereq.* Written permission of instructor.

PAH 3101 Principles of Medicine 1 6 QH

Offers an intensive, three quarter, organ-system based sequence encompassing anatomy, physiology, pathophysiology, and therapy of disease. (This course is the major component of the second-year curriculum of the Tufts School of Medicine and meets for approximately eighteen hours per week). *Prereq.* Admission to PharmD Program.

PAH 3102 Principles of Medicine 2 6 QH

Continues PAH 3101. *Prereq.* PAH 3101.

PAH 3103 Principles of Medicine 3 6 QH

Continues PAH 3102. *Prereq.* PAH 3102.

PAH 3201 Drug Literature Evaluation**2 QH**

Examines the principles and practice of drug information, literature retrieval, and evaluation of the pharmacy and medical literature. *Prereq. Admission to PharmD Program.*

PAH 3211, PAH 3212, PAH 3213**2 QH each****Pharmacotherapeutics 1, 2, 3**

Offers a three quarter sequence in advanced contemporary therapeutics of disease. Topics parallel material presented in the principles of medicine sequence. *Prereq. Admission to PharmD Program.*

PAH 3221 Psychosocial Aspects of Health Care— 1 QH Seminar

Studies psychological and social concerns that determine patient behavior and impact on health care. *Prereq. Admission to PharmD Program.*

PAH 3231 Pharmacokinetics in Drug Therapy**3 QH**

Examines the application of clinical pharmacokinetic information and techniques to patient care. Discusses the strategies of therapeutic drug monitoring for various drug categories and the use of decision analytic techniques in pharmacokinetic consultations. *Prereq. Admission to PharmD Program or permission of instructor.*

PAH 3311**4 QH****PAH 3312, PAH 3313, PAH 3314****3 QH each****Clerkship 1, 2, 3, 4**

Offers a four quarter sequence of advanced clinical clerkship rotations in patient care at various affiliated clinical sites. Students participate in "rounding" activities with medical and other health professionals and have the opportunity to provide drug information in the therapeutic decision-making process. The emphasis in these rotations is on helping students develop skills and familiarity with the application of drugs in the clinical setting as well as the usual progression of disease. Rotations include internal medicine, ambulatory care, and elective experiences. Involves approximately forty hours per week. *Prereq. Admission to PharmD Program.*

PAH 3321 Patient Assessment**2 QH**

Explores the general principles of history taking and physical examination. Focuses on organ systems of particular importance to the clinical pharmacist in monitoring drug response. *Prereq. Admission to PharmD Program.*

PAH 3601, PAH 3602 Seminar 1, 2**1 QH each**

Offers a two quarter sequence covering topics of relevance to the clinical pharmacy practitioner. Principles of effective communication and teaching are discussed. Students are expected to make oral presentations covering various therapeutic and related subjects as well as the progress of their investigational projects. *Prereq. Admission to the PharmD Program.*

PAH 3643 Biomedical Science Research Report 1**2 QH**

Requires students to present and participate in research group-related seminars, the format of which will be determined by students' advisers. *Prereq. Doctoral students only.*

PAH 3644 Biomedical Science Research Report 2**2 QH**

Continues PAH 3643. *Prereq. PAH 3643.*

PAH 3645 Biomedical Science Research Report 3**2 QH**

Continues PAH 3644. *Prereq. PAH 3644.*

PAH 3646 Biomedical Science Research Report 4**2 QH**

Continues PAH 3645. *Prereq. PAH 3645.*

PAH 3647 Biomedical Science Research Report 5**2 QH**

Continues PAH 3646. *Prereq. PAH 3646.*

PAH 3648 Colloquium Presentation**1 QH**

Requires students to present one formal seminar on their research. This presentation will be open to all those interested. *Prereq. Doctoral students only.*

PAH 3701 Human Nutrition**3 QH**

Studies nutrients considered essential for optimal human nutrition. Examines the digestion, absorption, metabolism, and excretion of each nutrient. Discusses food sources recommended, intakes for normal individuals, deficiency, and toxicity syndrome of public health interest.

PAH 3705 Nutrition Seminar**1 QH**

Aids the student in developing critical thinking regarding nutrition issues that are important to today's consumer. Introduces the student to a variety of readings that present varying viewpoints about nutrition issues and discusses these issues.

PAH 3707 Experimental Design and Biometrics**3 QH**

Discusses fundamental principles of experimental design and statistical analysis, with particular emphasis on clinical research. Topics include descriptive statistics, hypothesis testing, analysis of variance, correlation, regression, chi-square test, and nonparametric methods.

PAH 3731 New Computers for Health Care**3 QH**

Introduces computer applications and management of computer applications in health care. Applies the principles of information flow or clinical patient data to the information system lifecycle, emphasizing systems analysis process applied to health care application selection, implementation, evaluation, and monitoring. Analyzes representative applications in different health care disciplines and stresses the manager's role.

PAH 3799 Dissertation Continuation**0 QH**

Continues PAH 3813. *Prereq. PAH 3813 must be taken three times before registering for this course.*

PAH 3801 Investigational Project**2 QH each**

Offers the opportunity to demonstrate the ability to identify a problem within the domain of clinical pharmacy, formulate a hypothesis, develop methods to collect and interpret the data in order to test the hypothesis, and report the investigation in writing using a thesis format. (Note "Investigational Component of PharmD Program.") *Prereq. Admission to PharmD Program.*

PAH 3804 Investigational Project Continuation**1 QH**

Prereq. PAH 3801.

- PAH 3813 Dissertation** 0 QH
Prereq. Written consent.
- PAH 3805 Independent Study PharmD** 3 QH
Prereq. Written permission of instructor.
- PCL 3101 Concepts in Pharmacology** 2 QH
Offers in-depth coverage of the fundamental principles of pharmacology. Covers pharmacodynamics, including dose-effect relationships and drug-receptor interactions. Presents pharmacokinetic concepts, including absorption, distribution, and elimination as well as common pathways of drug metabolism. Other topics include pharmacogenetics, drug resistance, tolerance, and physical dependence. Provides an overview of the drug discovery and development process. The course is a necessary prerequisite for succeeding courses in pharmacology and toxicology. *Prereq. Admission to a graduate department or permission of the instructor.*
- PCL 3121 Experimental Pharmacology** 2 QH
Offers a lab experience with experimental pharmacology involving whole animal, isolated tissues, and drug receptors to demonstrate classical research methodologies. *Prereq. PCL 3101, PCL 3153, and admission to Pharmacology or Toxicology programs, or permission of Pharmacology Program director.*
- PCL 3131 Receptor Pharmacology** 2 QH
Reviews receptors for drug substances and for endogenous ligands in a format that combines lecture presentations and discussion. Focuses on the evaluation of current literature. Covers techniques available to study receptors; various models for receptor-ligand interaction; stereochemical aspects of receptor interactions; receptor-mediated coupling mechanisms; and evaluation of several specific receptor systems. *Prereq. MLS 3301, PCL 3101, INT 3101, INT 3102, INT 3103, or permission of instructor.*
- PCL 3141 Pharmacology of Drug Dependence** 2 QH
Surveys the major drug classes subject to misuse and addiction. Emphasizes general concepts of tolerance and dependence, the general pharmacology of prototypes of abused drugs, patterns and consequences of abuse in humans, and recent research advances. Examines selected research papers critically to stimulate quantitative pharmacologic thinking. *Prereq. PCL 3101.*
- PCL 3153 Pharmacological Basis of Therapeutics 1** 2 QH
Surveys the chemical and pharmacological basis of the major classes and characteristics of a prototype drug from each class. Characteristics studied include indications, adverse reactions, contraindications, structure-activity relationships, metabolism, mechanisms of action, and clinically significant interactions. Reading assignments cover animal models relevant to therapeutic screening and/or testing and the appropriate design of clinical trials. *Prereq. PCL 3101.*
- PCL 3154 Pharmacological Basis of Therapeutics 2** 2 QH
Continues PCL 3153. *Prereq. PCL 3153.*
- PCL 3155 Pharmacological Basis of Therapeutics 3** 2 QH
Continues PCL 3154. *Prereq. PCL 3154.*
- PCL 3301 Pathology** 2 QH
Introduces the study of the nature of disease, emphasizing the general mechanisms and pathogenesis. Of paramount importance is the effect of disease on the human body. The language of disease is stressed. Basic principles of disease processes and more common special diseases are extensively covered. A research paper may be assigned at the discretion of the instructor. *Prereq. anatomy and physiology.*
- PCL 3601 Pharmacology Seminar** 1 QH
Provides the opportunity for students to gain experience in oral and written presentation and in interpreting pharmacological data. Offers topics from current pharmacology literature selected by participants. *Prereq. PCL 3101.*
- PCL 3801 Pharmacologic Methods 1** 3 QH
Students carry out experiments in the lab of a pharmacology or toxicology faculty member. The experiments serve to demonstrate the techniques utilized in that lab to study a pharmacologic question. *Prereq. PhD students only.*
- PCL 3802 Pharmacologic Methods 2** 3 QH
Continues PCL 3801. *Prereq. PCL 3801.*
- PCL 3811 Research Report in Pharmacology 1** 2 QH
Offers a selected research project undertaken by the student under the direction of a faculty member. *Prereq. PCL 3101.*
- PCL 3812 Research Report in Pharmacology 2** 2 QH
Continues PCL 3811. *Prereq. PCL 3811.*
- PCL 3821 Pharmacology Thesis** 2 QH
Students may register three times (6 QH). *Prereq. Written permission from program director.*
- PCT 3101 Introduction to Biopharmaceutics and Pharmacokinetics** 3 QH
Offers the opportunity to students to remedy deficiencies in biopharmaceutics and pharmacokinetics. Topics include general concepts of one and two compartment models; linear and nonlinear pharmacokinetics; drug kinetics after intravenous, intramuscular, or oral administration; practical methods of compartmental models utilizing plasma and/or urinary data; multiple dosing kinetics; bioavailability and bioequivalence of drug products; and effect of renal impairment on drug kinetics. *Prereq. Permission of instructor.*
- PCT 3111 Clinical Pharmacokinetics** 2 QH
Focuses on applying various pharmacokinetic techniques to estimating dosage regimens, evaluating drug therapy, consulting on drug selection, and assessing bioavailability and bioequivalence data. *Prereq. A background in biopharmaceutics or permission of instructor.*
- PCT 3112 Pharmacokinetics** 3 QH
Acquaints graduate students with the theoretical compartmental analysis in pharmacokinetics. Topics include derivation and treatment of general equations for linear and nonlinear mammillary models. Uses of Laplace transform, transfer functions, general partial

fraction theorem, and input-disposition functions in pharmacokinetics. Emphasizes practical methods used to kinetically analyze the absorption, distribution, and elimination of drugs. Explores computer methods, physiological models, and stochastic compartmental systems. *Prereq.* MTH 1245, MTH 1246, graduate standing, and permission of instructor.

PCT 3161 Drug Metabolism 2 QH

Presents the current principles and methods for studying the metabolic transformation and physiological disposition of drugs and other chemicals of pharmacological and toxicological interest. Covers the chemistry of Phase I and Phase II reactions from a mechanistic and empirical viewpoint. Assesses the role of structure, bonding, molecular configuration, substitution, and related physiochemical factors in the enzymatic reactions, as well as the effects of enzyme induction and other factors in the enzymatic reaction. Explores the effects of enzyme induction and other factors such as species, sex, and age on the extent of metabolism. *Prereq.* PCL 3010 or permission of instructor.

PCT 3200 Advanced Pharmaceutics 2 QH

Studies the theoretical principles of modern physical pharmacy. Emphasizes physical insight and mathematical rigour. Topics include application of basic principles of thermodynamics, colligative properties, colloidal systems, molecular and micellar association, surface chemistry, mass transport phenomena, and chemical stability of drugs. *Prereq.* PCT 1340, PCT 1350, or permission of instructor.

PCT 3205 Novel Drug Delivery System 2 QH

Conventional use of drugs in the treatment of prevention of disease can be hampered by their indiscriminate action, often leading to side effects. In addition, many drugs are unable to reach target areas in the body in effective concentrations, while others are prematurely excreted or inactivated. During the last decade there have been concerted attempts to circumvent such problems by the use of delivery systems that transport drugs safely to sites when they are needed, and facilitate and/or control their release. This class attempts an in-depth examination of the methodology and significance of these novel delivery systems. Topics include the following systems that are currently under investigation: nanoparticles, cellular vectors, microcapsules, microspheres, prodrugs, liposomes as drug carriers, polymeric systems, and macromolecular systems such as DNA, glycoproteins, monoclonal antibodies, and hormones. *Prereq.* PCT 3101, PCT 3200 or permission of instructor.

PHP 3101 Hospital Pharmacy Administration 1 3 QH

Studies management of a department's personnel and financial resources. Covers management skills, personnel administration and organization, as well as budget preparation, analysis, and control, and hospital reimbursement.

PHP 3102 Hospital Pharmacy Administration 2 3 QH

Presents an overview of hospital pharmacy services and an introduction of areas of the hospital that either require or relate to pharmacy services. Discusses

hospital administration, materials management, quality assurance programs, committee responsibilities, and drug distribution systems, as is the development and writing of a proposal for new services.

PHP 3121 Health Care Administration 1 3 QH

Examines the socioeconomics and statistics of health care, including governmental programs, legislative trends, third-party insurance and welfare programs, and other areas that may affect the management of the modern institutional pharmacy. *Prereq.* Admission to the hospital pharmacy program or permission of instructor.

PHP 3131 Computer Applications in Hospital Pharmacy 3 QH

Reviews past, present, and future applications of computer systems in institutional practice. Covers management aspects of computer systems development and selection. Discusses microcomputers and departmental computers to support clinical and management practice.

PHP 3141 Legal Aspects/Federal Legislation in Pharmacy 2 QH

Analyzes the federal and state laws relating to the distribution of drugs in the institution. Topics include common-law liabilities such as malpractice and other frequently encountered problems. *Prereq.* Admission to hospital pharmacy program.

PHP 3165 Special Topics in Hospital Pharmacy 2 QH

Selected topics of interest to hospital pharmacy practitioners.

PHP 3201 Clinical Pharmacy 3 QH

Considers the patient-oriented aspects of the application of therapeutic agents to hospital patients. Studies the relation of therapeutic regimens to lab tests and drug interactions, as well as the role of the hospital pharmacist as an active member of the health-care team dealing directly with inpatients and outpatients. *Prereq.* Admission to hospital pharmacy program or permission of instructor.

PHP 3211 Contemporary Therapeutics 1 3 QH

Explores recent developments in current therapeutic approaches and their rationale in the treatment of cardiovascular, neurological, gastrointestinal, musculoskeletal, and metabolic diseases of a noninfectious nature. Discusses therapy related to aging and selected genetic diseases. *Prereq.* PHP 3201.

PHP 3212 Contemporary Therapeutics 2 3 QH

Examines current concepts of infectious diseases and the rationale for the chemotherapeutic treatment of these conditions. Studies diseases of the blood and blood-forming organs, neoplastic disease, and diseases related to deficiency states. *Prereq.* PHP 3201.

PHP 3231 Drug Monitoring 3 QH

Presents the process by which drugs are monitored to determine their effectiveness, safety, prevention of iatrogenic factors, drug-drug interactions, and matters affecting patient compliance with a therapeutic regimen. Considers the utilization of this information in improving patient care. *Prereq.* Written permission.

PHP 3241 Sterile Products**3 QH**

Studies theory principles, methods, and techniques in preparing sterile, pyrogen- and particulate-free products. Discusses equipment and lab design required for manufacturing different types of sterile products and the practical considerations essential for their production. *Prereq.* *Permission of instructor.*

PHP 3601 Seminar on Hospital Pharmacy**3 QH**

Offers a seminar on current developments or specific problems in hospital pharmacy that have been studied in-depth by students with guidance from the graduate faculty. The student presentations may be alternated with guest speakers on topics of current interest. Student participation in the discussions is an essential objective of the course. *Prereq.* *Admission to hospital pharmacy program.*

PHP 3801 Hospital Pharmacy Thesis**2 QH**

Students may register three times (6 QH). *Prereq.* *Written permission of instructor.*

PMC 3101 Chemistry of CNS Depressants**3 QH**

Presents and discusses the chemistry, structure-activity relationships, and mechanism of action of general anesthetics, hypnotics and sedatives, anti-epileptics, analgesics, tranquilizers, and muscle relaxants. Considers the mechanics of drug design and methods of modification. *Prereq.* *PMC 3105 or permission of instructor.*

PMC 3102 Chemistry of Autonomic Drugs**3 QH**

Discusses drug action on the central nervous system, emphasizing the action mechanism of the chemical mediators of the peripheral nervous system. Considers the role of the agents affecting this system—adrenergic and cholinergic and reversible and irreversible inhibitors of these systems—in relation to their chemical structure and biological activity. *Prereq.* *PMC 3105 or permission of instructor.*

PMC 3103 Chemistry of Anti-Infectives**3 QH**

Studies the organic medicinal chemistry of various chemotherapeutic agents used to treat infectious diseases. Focuses on chemistry, mechanism of action, structure activity relationships, and recent research. Topics include antibacterials (sulfonamides, antifolates, and quinolones), antibiotics (beta-lactams, aminoglycosides, and tetracyclines), antivirals, and investigational drugs used in HIV infection therapy. *Prereq.* *PMC 3105 and biochemistry or permission of instructor.*

PMC 3104 Biochemical and Pharmacological**3 QH****Principles of Cancer Chemotherapy**

Presents recent developments in new approaches to the treatment of cancer, including alkylating agents, antimetabolites, hormones, miscellaneous compounds, and combinations of the above with radiation and immunology. Explores possible mechanisms of chemotherapeutic action. *Prereq.* *PMC 3105 or permission of instructor.*

PMC 3105 Principles of Medicinal Chemistry**3 QH**

Presents fundamental chemical and stereochemical principles that account for properties of drugs and contribute to an understanding of drug action. Focuses on the physicochemical properties of functional groups as they relate to overall properties of drug molecules. Topics include delivery of drugs to the central nervous system in terms of lipophilicity/hydrophilicity, ionization potential and hydrogen-bonding capability; the interaction of drugs with neurotransmitter, hormonal, and neurohormonal systems; qualitative and quantitative structure activity relationships; drug biotransformation; and principles of and recent developments in drug design.

PMC 3171 Heterocyclic Drugs in Medicinal Chemistry**3 QH**

Studies the application of the combined principles of medicinal and heterocyclic chemistry to the synthesis of pharmaceutically useful compounds. Emphasizes a critical evaluation of the literature methods with respect to synthesis and biological activity. *Prereq.* *Advanced organic chemistry or permission of instructor.*

PMC 3511 Advanced Drug Synthesis**4 QH**

Presents the application of synthetic and analytical techniques to the preparation of biologically active compounds and their intermediates. Demonstrates the process of drug development from design to synthesis to final characterization. Includes laboratory documentation and report preparation.

PMC 3601 Medicinal Chemistry Seminar**1 QH**

Reports and discussions involving current journal articles and research in medicinal chemistry. *Prereq.* *PMC 3101.*

RSC 3201 Radiopharmaceutical Chemistry**3 QH**

Discusses the application of chemistry to the design and synthesis of radiodiagnostic agents. Presents the properties of the radionuclides and their biological carriers as they relate to their uses in nuclear medicine. *Prereq.* *PMC 3105 or permission of instructor.*

RSC 3811 Radiopharmaceutical Chemistry**2 QH****Research Report 1**

Provides the student with a selected research project related to radiopharmaceutical chemistry under the supervision of a faculty member. Involves a laboratory project or an extensive literature review of topic of current interest in the field.

TOX 3101 Concepts in Toxicology 1**3 QH**

Presents the principles of toxicology from an organ system perspective. Focuses on the concepts used to evaluate toxicity; the mode of injury at the organ and cellular level; and the basic subcellular mechanisms through which toxic agents produce damaging effects. Uses recent toxicological literature to introduce concepts for evaluating toxicity through data analysis.

TOX 3102 Concepts in Toxicology 2**3 QH**

Continues TOX 3101. Emphasizes the interpretation of toxicological literature to evaluate the risk involved in exposure to prototype chemicals. Employs structure activity and biochemical methods of assessment to evaluate the toxicity of major classes of chemical compounds.

TOX 3121 Environmental Toxicology**3 QH**

Discusses the distribution, interaction, and effects of toxic agents on the biosphere. Examines pollutants grouped by chemical and use characteristics including pesticides, food additives, metals, carcinogens, and teratogens. Addresses the action mechanism and selectivity basis of toxic agents. Applies the results of toxicologic investigation to understanding the environment's chemical pollution.

TOX 3501 Biochemical Toxicology Laboratory**4 QH**

Introduces investigative methods for assessing toxicity. Develops the ability to analyze and interpret data generated in lab and in the literature, and sharpens technical report writing skills.

Physician Assistant

The Physician Assistant Program is a post-baccalaureate certificate program. Most of the courses are available to physician assistant students only. Other students interest in enrolling in physician assistant courses must have the permission of the Physician Assistant Program's director.

MLS 1109 Foundations of Medical Laboratory Science**4 QH**

Introduces basic lab methods employed in primary care, including urinalysis, gram staining, hematocrit, hemoglobin, sedimentation rate, white-cell count, and differential. Lab. *Prereq. PA students only.*

PA 1120 Roles, Rules, and Resources for Physician Assistants**2 QH**

Examines the role of physician assistants, including the manner in which they interact with other health professionals, as well as the way in which their role is perceived by others. Provides an understanding of the law as it relates to physician assistants' actions and to help them develop the ability to make referrals to common community resources. *Prereq. PA students only.*

PA 1125 Human Anatomy**2 QH**

Considers the basic structure of the human body, highlighting those features which are of clinical importance. Emphasizes the gastrointestinal, cardiovascular, respiratory, neurological, and musculoskeletal systems. *Prereq. PA students only.*

PA 1133 Physical Diagnosis 1**5 QH**

Presents techniques for taking an accurate history and performing a physical examination as well as organizing the results for oral and written presentation. Includes discussion, demonstrations, and patient workups. *Prereq. PA students only.*

PA 1134 Physical Diagnosis 2**5 QH**

Explores techniques of obtaining and presenting an accurate history; performing a competent and thorough physical examination; and synthesizing the results of the history, physical, and laboratory findings to arrive at an accurate evaluation of the patient. Uses discussion, demonstrations, and patient workups. *Prereq. PA students only.*

PA 1138 Medical Physiology 1**4 QH**

Covers principles of gastrointestinal, respiratory, endocrine, and cardiovascular human physiology. *Prereq. PA students only.*

PA 1140 Medical Physiology 2**2 QH**

Discusses principles of cardiovascular and renal physiology. *Prereq. PA students only.*

PA 1321 Patient Education and Counseling**2 QH**

Provides an opportunity to acquire the knowledge necessary for educating and counseling patients. Demonstrates ways in which to evaluate patients' needs and readiness to learn, as well as the use of common teaching techniques for issues such as chronic disease management, ostomies, diabetes, heart disease, nutrition counseling, and sex education. *Prereq. PA students only.*

PA 1322 Medical Care and Current Social Problems**2 QH**

Studies the principal components of the health care delivery system, with emphasis on services, organization, and funding. Uses selected social problems to demonstrate the operation of the medical care system. *Prereq. PA students only.*

PA 1323 Principles and Concepts of Emergency Medicine**3 QH**

Introduces the principles of life-support techniques. Focuses on the initial management of acute medical and traumatic conditions in hospital and prehospital situations. Students are instructed in basic cardiopulmonary resuscitation techniques. *Prereq. PA students only.*

PA 1335 Principles of Interviewing**2 QH**

Examines various methods of interviewing patients. Focuses on establishing a relationship and understanding the effects of cultural background and psychosocial problems on the patient's response to illness and death and dying. *Prereq. PA students only.*

PA 1336 Pathophysiology and Medicine 1**3 QH**

Presents a systems approach to the principles of disease processes in people. Topics include physiology, pathophysiology, the natural history of disease, diagnostic procedure, and therapeutic measures. Hematology and cardiology problems are usually covered. *Prereq. PA students only.*

PA 1337 Pathophysiology and Medicine 2 3 QH
Continues PA 1336. Covers topics that may include pulmonary, gastroenterology, immunology, and rheumatology problems. *Prereq. PA students only.*

PA 1338 Pathophysiology and Medicine 3 3 QH
Continues PA 1337. Topics may include renal, endocrine, oncology, infectious disease, and sexually transmitted disease problems. *Prereq. PA students only.*

PA 1340 Introduction to Clinical Rotations 4 QH
Offers clinical rotations, expectations, and requirements for students about to enter their clinical year. Some review of history taking and physical examination skills is conducted, and students are instructed in various clinical procedures. *Prereq. PA students only.*

PA 1341 Applied Study in Emergency Medicine 4 QH
During this rotation, the student has the opportunity to become familiar with the problems encountered in an emergency room. The student is responsible for taking medical histories and performing physical examinations on acute as well as nonemergent patients and presenting these to the medical preceptor. When appropriate, the necessary diagnostic and therapeutic measures are performed. Through didactic sessions at the clinical site as well as clinical training, the student may also be exposed to the emergency management and treatment of conditions such as trauma, shock, burns, asthma, poisoning, allergic reactions, seizures, and respiratory failure. *Prereq. Successful completion of first year of Physician Assistant Program.*

PA 1342 Applied Study In Medicine 4 QH
Offers the student opportunity to take and record histories and perform physical examinations during in-hospital rotation. Provides the opportunity to become versed in the assessing and managing a variety of medical problems by attending medical rounds and conferences, performing diagnostic procedures, presenting case write-ups, recording progress notes, and working under the supervision of a doctor of medicine. Emphasis is placed on the skills of collecting, assessing, and presenting patient data for physician review; ordering appropriate laboratory and diagnostic studies; counseling patients in therapeutic procedures; and helping to coordinate the contributions of other health professionals in the management of the patient. *Prereq. Successful completion of first year of Physician Assistant Program.*

PA 1343 Applied Study in Pediatrics 4 QH
During the pediatric rotation, the student may develop familiarity with outpatient pediatric problems through training in clinics and private pediatric offices. Emphasis during this training is on caring for the child from birth through adolescence. Students are given the opportunity to take histories and perform pediatric physical examinations. Diagnosis and management of common childhood illnesses and evaluation of the variations of growth and development are also stressed. Students have the opportunity to develop skills with which to counsel parents on immunizations, child visits, parameters of growth and development, common psychosocial problems, nutrition, and accident

and poisoning prevention. Students may also have the chance to learn how to administer immunizations and do audio and visual screening. *Prereq. Successful completion of first year of Physician Assistant Program.*

PA 1344 Applied Study in Psychiatry 4 QH
Offers exposure to a wide variety of psychiatric problems. Clinical settings include wards, clinics, and multiservice centers. Students are expected to perform mental status exams and to do cognitive testing. Emphasis is on recognizing various types of psychiatric problems that require referral to a specialist and managing those problems that can be handled by the nonspecialists. Assists students in furthering their understanding of effective patient interactions and the psychiatric components of health, disease, and disability. *Prereq. Successful completion of first year of Physician Assistant Program.*

PA 1345 Applied Study In Obstetrics and Gynecology 4 QH
Provides students the opportunity to become involved with obstetric and gynecological services provided by teaching hospitals in the Boston area. Emphasizes pre- and post-natal care, monitoring a woman in labor, assisting in deliveries, and developing the skill necessary to deliver a child in an emergency situation. Students have the opportunity to take obstetrical histories and perform obstetrical examinations. While rotating through gynecology, the student is expected to learn how to assess and manage a variety of common gynecological problems and to counsel patients on family planning. *Prereq. Successful completion of first year of Physician Assistant Program.*

PA 1346 Applied Study in Ambulatory Medicine 1 4 QH
Offers exposure to aspects of general medical and family practice with emphasis placed on personalized care of healthy and sick patients. Patient education, counseling, and integration of community services, as well as medical diagnosis and management, are considered a major part of this rotation. *Prereq. Successful completion of first year of Physician Assistant Program.*

PA 1348 Principles of Orthopedics 3 QH
Discusses common orthopedic problems, including those of the hand, knee, shoulder, and back. Examines special problems of acute trauma and the management of uncomplicated orthopedic cases. Additional topics may include techniques of completing an adequate patient history and physical examination of the orthopedic patient. *Prereq. PA students only.*

PA 1350 Principles of Primary Care Management 3 QH
Studies approaches to and management of the patient in a primary care setting. Discusses specific diseases and medical conditions common to primary care practice, including low back pain, anxiety, fatigue and weight loss, chest pain, gastrointestinal problems, upper respiratory infections, obesity, and dermatologic complaints. Considers psychosocial aspects of disease as well as aspects of prevention. Students are expected to have a sound basis in pathophysiology and medicine. *Prereq. PA students only.*

PA 1353 Principles of Pediatrics**3 QH**

Examines physiological and psychological fundamentals of child development. Focuses on the major common pediatric illnesses, their signs, symptoms, and treatment regimens; various types of medications used in pediatrics, their indication and dosage in relation to specific disorders; and the management of pediatric emergencies such as cardiac arrest, anaphylaxis, convulsions, coma, and high fevers. *Prereq.* PA students only.

PA 1354 Principles of Psychiatry**3 QH**

Offers an opportunity to understand how to work with patients and families exhibiting psychiatric problems. Topics include psychological growth and development, the effect of social milieu on behavior, the psychological bases of drug and alcohol abuse, and the dynamics of psychosomatic problems. *Prereq.* PA students only.

PA 1355 Principles and Concepts of Surgical Intervention In Disease Processes**3 QH**

Studies major and minor surgical conditions, with an emphasis on indications for surgical intervention and pre- and post-operative management in both the ambulatory and inpatient settings. *Prereq.* PA students only.

PA 1356 Basic Diagnostic Radiology**2 QH**

Introduces the underlying principles, use, and interpretation of radiographs pertinent to primary care medicine. *Prereq.* PA students only.

PA 1358 Medical Therapeutics**3 QH**

A case-study format that involves students in planning the management of common disease states. Used to help students understand the clinical use of common therapeutic agents. *Prereq.* PA students only.

PA 1359 Applied Study in Surgery**4 QH**

During this rotation students participate in a variety of surgical patient care responsibilities under the supervision of a surgical resident and/or staff surgeon. The rotation emphasizes general surgery, but the students have an opportunity for varying exposure to other surgical specialties and sub-specialties. Students assist in the initial assessment of the surgical patient, including obtaining an accurate medical history and performing a physical examination. As members of the surgical team, the students are involved in pre-operative management, including patient education and any procedures necessary to prepare the patient for surgery. Students assist the surgeon in the operation room when appropriate and have the opportunity to become familiar with operating room procedures and equipment. Students are also involved in the post-operative evaluation and management of the patient. Students will have the opportunity to attend surgical grand rounds and other surgically oriented educational meetings when available at their rotation sites. *Prereq.* Successful completion of first year of Physician Assistant Program.

PA 1360 Applied Study in Ambulatory Medicine 2**4 QH**

During this rotation the students participate in providing health care to the adult outpatient under the supervision of a physician specialist in internal medi-

cine. The students will have the opportunity to become involved in the initial assessment and management of adults with a medical complaint as well as the ongoing assessment and management of patients with established diagnoses. It is anticipated that the student will be exposed to many of the common problems encountered in medical practice, such as hypertension, diabetes, and heart disease. The emphasis is on the assessment and management of both acute and chronic medical problems. *Prereq.* Successful completion of first year of Physician Assistant Program.

PA 1361 Applied Study Elective**4 QH**

Offers additional exposure to an area of clinical medicine in which the student has a special interest. Student may choose additional experience in an area covered by required rotations or select a subspecialty such as dermatology, orthopedics, cardiology, geriatrics, etc. All elective rotations are reviewed and must be approved by the clinical coordinator. *Prereq.* Successful completion of first year of Physician Assistant Program.

PA 1362 Principles of Obstetrics**2 QH**

Discusses the physiologic changes in pregnancy with nutrition, prenatal care, medical complications, and surgical complications of pregnancy, labor, and delivery. Also covers managing pre- and post-natal periods and diagnosing and treating sexually transmitted diseases. *Prereq.* PA students only.

PA 1363 Principles of Gynecology**2 QH**

Studies the anatomy and physiology of the human reproductive system, the methods and effectiveness of contraception, and any contraindications. Also explores the medical indications for abortion and the appropriateness of the various methods of pregnancy termination. Emphasizes the causes, signs, and treatments of common gynecological problems, including the significance of early cancer detection. *Prereq.* PA students only.

PA 3101 Clinical Neurology**4 QH**

Presents the clinical application of neuroanatomy and neurophysiology. Offers the opportunity to develop an understanding of the normal functioning of the nervous system as well as to develop a clinical approach to the assessment and management of a variety of nervous system disorders and disease states. *Prereq.* PA students only.

PA 3102 Principles of Electrocardiography**4 QH**

Examines principles of electrophysiology and its application to electrocardiographic tracing. Topics include recognizing arrhythmias, rate and axis determination, conduction abnormalities, characteristic changes seen in myocardial infarction and ischemia, as well as drug and metabolic effect manifested on the electrocardiogram. *Prereq.* PA students only.

PA 3103 Rehabilitation Medicine**4 QH**

Studies techniques of effective planning and decision making for patients with multiple chronic problems. The purposes, techniques, and potential of rehabilitation medicine are also discussed. *Prereq.* PA students only.

PCL 1300 Basic Pharmacology 1**2 QH**

Covers the classification, mechanism of action, and uses of a spectrum of therapeutic agents. Emphasizes dose response, side effects, and adverse reactions.

Prereq. PA students only.

PCL 1301 Basic Pharmacology 2**3 QH**

Examines the classification, mechanisms of action, and uses of a broad spectrum of therapeutic agents. Focuses on dose response, side effects, and adverse reactions.

Prereq. PA students only.

PHL 3265 Issues in Medical Ethics**4 QH**

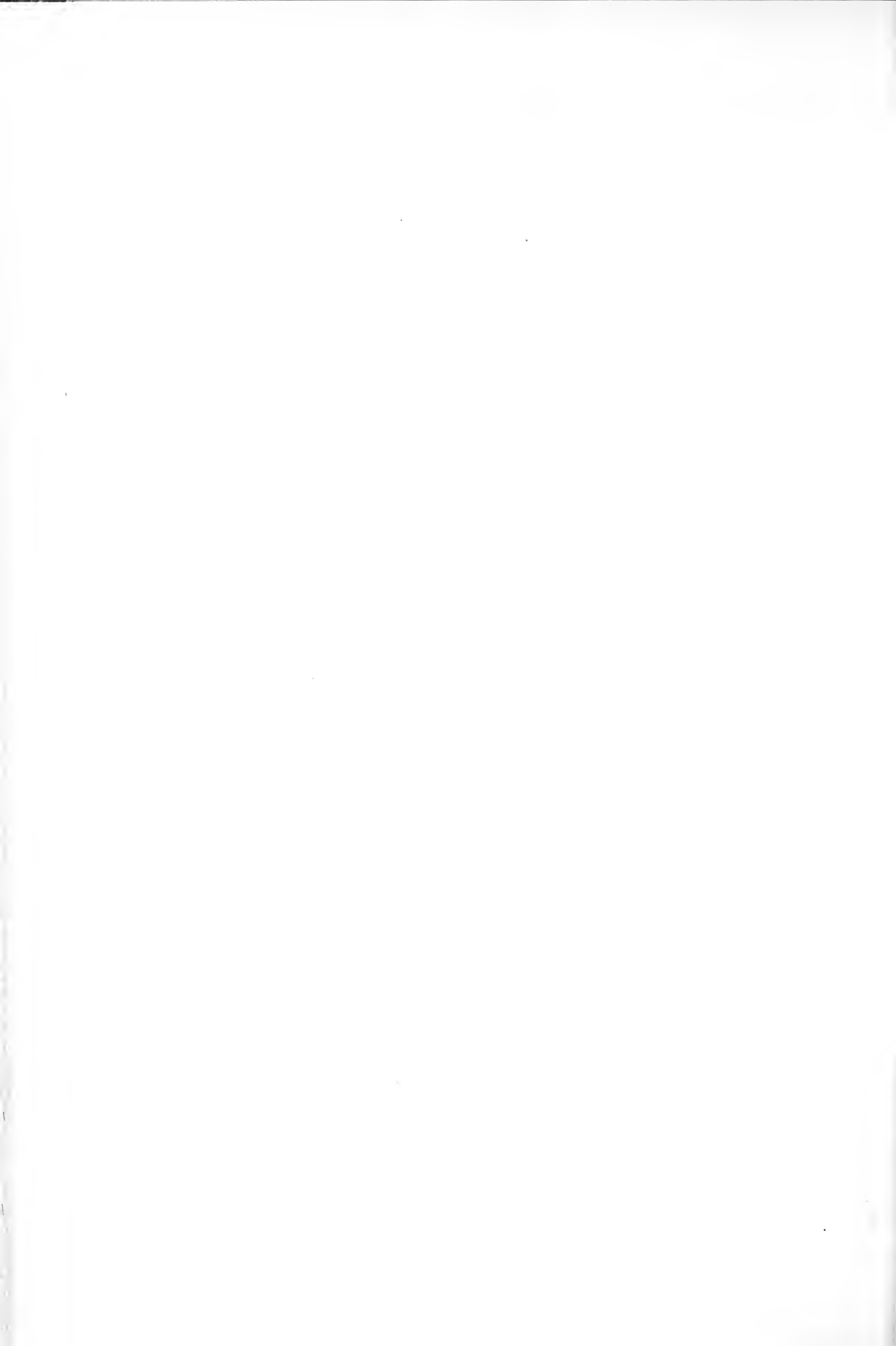
Familiarizes students with various philosophical perspectives in medical ethics, including historical, classical, ethical, and contemporary philosophies related to issues such as abortion, truth telling, genetic control, and the allocation of scarce medical resources. Discusses euthanasia and paternalism, among other topics.

Prereq. PA students only.

SOC 3226 The Aging Process**3 QH**

Studies the socioeconomic and social-psychological consequences of aging from the perspective of health care providers. Focuses on the biological changes entailed in aging and the appropriate medical management of geriatric patients.

Prereq. PA students only.



Graduate School of Professional Accounting

*All courses carry five quarter-hours of credit unless
otherwise specified.*

ACC 3401 Accounting Problems 1

Accelerates introduction to the basic accounting process and the preparation of general-purpose financial statements. Topics include assets, liabilities, and present value concepts. *Prereq.* *Principles of accounting.* *Completion of a self-instructed, programmed text on basic accounting.*

ACC 3402 Cost Accounting Theory and Problems

Analyzes specialized problems of cost accumulation and cost behavior. Topics include cost-volume-profit analysis, standard costs and budgeting, overhead analysis, and capital budgeting. Stresses costs involved in managerial decision making.

ACC 3404 Accounting Problems 2

Continues ACC 3401, including property and equipment, depreciation, long-term liabilities, stockholders equity, earnings per share, income tax accounting, and other deferrals. *Prereq.* *ACC 3401.*

ACC 3405 Accounting Problems 3

Examines specialized accounting topics such as pensions, leases, accounting changes, statement of changes in financial position, partnerships, and government accounting. *Prereq.* *ACC 3404.*

ACC 3406 Advanced Accounting Problems

Studies business combination, including the purchase and pooling methods. Topics include intercompany profits, indirect and reciprocal holdings, and foreign currency translations. *Prereq.* *ACC 3405.*

ACC 3407 Auditing Theory and Practice

Examines auditing concepts, standards, and procedures. Topics include: the legal and ethical responsibilities of the auditor, statistical sampling, auditing and EDP, audit reports, and audit procedures. Stresses the nature and objectives of auditing. *Prereq.* *ACC 3404.*

ACC 3408 Federal Income Tax Accounting 1 6 QH

Studies the Internal Revenue Code, regulations, revenue rulings, and relevant cases. Emphasizes taxation of individuals, corporations, partnerships, estates and trusts, tax-planning and tax research. *Prereq.* *ACC 3404.*

ACC 3409 Federal Income Tax Accounting 2

Continues ACC 3408. Focuses on taxation of corporations, tax planning, and tax research. *Prereq.* *ACC 3408.*

ACC 3413 Contemporary Accounting Theory

Offers a capstone course on the theoretical concepts of accounting, focusing on current accounting concepts, issues, and trends. Examines standards and opinions issued by various accounting organizations.

FIN 3414 Management of Financial Resources

Uses case studies to provide a comprehensive examination of corporate financial management and capital management. Explores the various sources of capital, and discusses financial institutions and securities markets.

HRM 3403 Organizational Behavior

Uses case studies to examine behavior in profit and nonprofit organizations. Gives students an opportunity

to study and develop skills in behavior management.

MEC 3412 Managerial Economics (Quantitative Approach)

Considers decision-making under conditions of uncertainty: allocation of scarce resources, utilizing linear programming models, determination of optimal decision rules, sensitivity analysis, examination of the most frequently encountered sampling distributions, and economic models for estimating demand-and-cost relationship.

MGT 3415 Business Law

Examines contracts, partnerships, corporations, agency, commercial paper, sales, and other topics essential for professional development in the business and legal environment.

MGT 3416 Business Policy In a Societal Setting

Uses case studies to focus on business decisions confronting management. Examines policy decisions and their impact on various sectors of society, such as stockholders, customers, suppliers, the public and government.

MKT 3410 Marketing

Examines marketing research, as well as organizational, planning, and control systems. Topics include customer/client analysis, product/service planning, pricing, communications, advertising and sales promotion and distribution management strategies.

MSC 3404 Information Systems

Presents the principles of management information systems and focuses on issues relevant to audit and control and incorporating an introduction to computer-based systems. Examines basic computer and information systems concepts including hardware, software, and systems development. Emphasizes managing, planning, and controlling the computer resource; security and privacy issues; and computer auditing.

MSC 3409 Operations Management

Introduces the organization and management of production systems using case studies. Discusses the three major types of production systems, flow, job, and project, with special emphasis given to capacity, scheduling, inventory, and control.

MSC 3411 Information Systems

Introduces computers and management information systems, focusing on issues relevant to audit and control. Examines basic computer and information-systems concepts, including computer hardware, software, and systems development. Emphasizes managing, planning, and controlling computer resources, security and privacy issues, and computer auditing.

Appendix

Academic Calendar 1990-1991

September 1990

3	Monday	Labor Day. University closed.
4-7	Tuesday-Friday	Final examinations for graduate schools.
10-23	Monday-Sunday	Vacation period.
11-12	Tuesday-Wednesday	Fall 1990 registration—Burlington 5:00-7:30 PM.
13	Thursday	Fall commencement.
17-20	Monday-Thursday	Fall 1990 registration—Boston 9:30 AM-7:00 PM.
24	Monday	Beginning of 1990-1991 academic year. Graduate classes begin.

October 1990

8	Monday	Columbus Day. University closed.
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November 1990

12	Monday	Veterans' Day observed. University closed.
22-25	Thursday-Sunday	Thanksgiving Day recess.
27	Tuesday	Winter 1991 registration—Burlington 5:00-7:30 PM.

December 1990

3-6	Monday-Thursday	Winter 1991 registration—Boston 9:30 AM-7:00 PM.
10-14	Monday-Friday	Final examination for graduate schools.
17-31	Monday-Monday	Christmas vacation.

January 1991

1	Tuesday	New Year's Day. University closed.
2	Wednesday	Graduate classes begin.
21	Monday	Martin Luther King, Jr.'s Birthday observed. University closed.

February 1991

18	Monday	Presidents' Day. University closed.
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March 1991

5	Tuesday	Spring 1991 registration—Burlington 5:00-7:30 PM.
11-14	Monday-Thursday	Spring 1991 registration—Boston 9:30 AM-7:00 PM.
18-22	Monday-Friday	Final examinations for graduate schools.

April 1991

1	Monday	Graduate classes begin.
15	Monday	Patriots' Day. University closed.

May 1991

27	Monday	Memorial Day. University closed.
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June 1991

10-11	Monday-Tuesday	Summer 1991 registration—Boston 9:30 AM-7:00 PM.
10-14	Monday-Friday	Final examinations for graduate schools.
12	Wednesday	Summer 1991 registration—Burlington 5:00-7:30 PM.
15	Saturday	Commencement.
17-23	Monday-Sunday	Vacation period.
24	Monday	Graduate classes begin.

July 1991

4	Thursday	Independence Day. University closed.
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September 1991

2	Monday	Labor Day. University closed.
9-22	Monday-Sunday	Vacation period.
12	Thursday	Fall commencement.
23	Monday	Beginning of 1991-1992 academic year.

Calendar dates are subject to change. The University community will be notified if such changes are necessary.

Northeastern University's Mission

Northeastern University's mission, as a large urban university founded on the cooperative model of education, is to provide excellence in education. The University achieves its mission through curricula that value equally knowledge for its own sake, knowledge as a means to success in the workplace, and knowledge as a cornerstone of personal achievement and satisfaction.

Achieving Northeastern University's mission requires excellence in teaching, and teaching remains the central activity of Northeastern's faculty. By offering undergraduate and graduate programs that are rigorous, relevant, and rewarding, the University provides a solid structure for educational excellence. Northeastern University is also committed to the search for knowledge through the scholarly and artistic undertakings of its faculty and students.

A central mandate of Northeastern University is to offer students the opportunity to apply directly lessons of the classroom and laboratory to the workplace through cooperative education. For three quarters of a century, cooperative education has been the keystone of Northeastern's uniqueness. As an increasing percentage of the nation's population enters the workforce, and new technologies continue to change the nature of work, the University has rededicated itself to helping the cooperative plan keep pace with those changes.

Northeastern University is committed to serving the educational needs of a diverse student population in an amenable physical environment. The University believes that its mission can be achieved only if the student body is not limited by economic status, cultural or racial background, geographic origin, sex, or age. Northeastern has a long history of serving the educational needs of the non-traditional student, providing degree and non-degree programs for people whose circumstances prevent them from following the standard college regimen.

Looking beyond the confines of the campus, Northeastern University is determined to maintain and strengthen its reputation as a friend to the City of Boston and a partner of the Commonwealth of Massachusetts. The University's obligation to serve the community of which it is an integral part is fulfilled primarily through the educational enterprise. Through its numerous outreach programs, the University has made striking contributions to the community in the applied social sciences, in high technology, and in the arts. Northeastern University will continue to contribute in these and other ways to the region's overall quality of life and to its economic vitality.

Accreditation

Northeastern University is accredited by the New England Association of Schools and Colleges, Inc., which accredits schools and colleges in the six New England states. Accreditation by the Association indicates that the institution has been carefully evaluated and found to meet standards agreed upon by qualified educators. The undergraduate business programs offered by Northeastern University are accredited by the American Assembly of Collegiate Schools of Business.

Equal Opportunity Employment Policy

Northeastern University does not discriminate on the basis of race, color, religion, sex, sexual preference, age, national origin, or veteran or handicap status in admission to, access to, treatment in, or employment in its programs and activities.

In addition, Northeastern will not condone any form of sexual harassment. Handbooks containing the University's nondiscrimination policies and its grievance procedures are available in the Office of Affirmative Action, 175 Richards Hall. Inquiries regarding the University's nondiscrimination policies may be directed to: Ellen S. Jackson, Dean/Director, Office of Affirmative Action, 175 Richards Hall, Northeastern University, Boston, Massachusetts 02115, (617) 437-2133.

Inquiries concerning the application of nondiscrimination policies may also be referred to the Regional Director, Office for Civil Rights, United States Department of Education, J.W. McCormack Building, Post Office Court House, Room 2222, Boston, Massachusetts 02109-4557.

Delivery of Services

The University assumes no liability, and hereby expressly negates the same, for failure to provide or delay in providing educational or related services or facilities or for any other failure or delay in performance arising out of or due to causes beyond the reasonable control of the University, which causes include, without limitation, power failure, fire, strikes by University employees or others, damage by the elements, and acts of public authorities. The University will, however, exert reasonable efforts, when in its judgment it is appropriate to do so, to provide comparable or substantially equivalent services, facilities, or performance, but its inability or failure to do so shall not subject it to liability.

The Northeastern University catalog contains current information regarding the University calendar, admissions, degree requirements, fees, and regulations, and such information is not intended to be and should not be relied upon as a statement of the University's contractual undertakings.

Northeastern University reserves the right in its sole judgment to promulgate and change rules and regulations and to make changes of any nature in its program, calendar, admissions policies, procedures and standards, degree requirements, fees, and academic schedule whenever it is deemed necessary or desirable, including, without limitation, changes in course con-

tent, the rescheduling of classes, cancelling of scheduled classes and other academic activities, and requiring or affording alternatives for scheduled classes or other academic activities, in any such case giving such notice as is reasonably practicable under the circumstances.

Northeastern will do its best to make available to you the finest education, the most stimulating atmosphere and the most congenial conditions it can provide. But the quality and the rate of progress of your academic career is in large measure dependent upon your own abilities, commitment, and effort. This is equally true with respect to professional advancement upon completion of the degree or program in which you are enrolled. The University cannot guarantee that you will obtain or succeed at any particular job; that will depend upon your own skills, achievement, presentation, and other factors such as market conditions at that time. Similarly, in many professions and occupations there are increasing requirements imposed by federal and state statutes and regulatory agencies for certification or entry into a particular field. These may change during the period of time when you are at Northeastern, and they may vary from state to state and from country to country. While the University stands ready to help you find out about these requirements and changes, it is your responsibility to initiate the inquiry because the University has no other way of knowing what your expectations and understandings are.

In brief, the University is there to offer you educational opportunities and to assist you in finding the direction in which you want to steer your educational experience. But you are a partner in this venture with an obligation and responsibility to yourself.

Family Educational Rights and Privacy Act

In accordance with the Family Educational Rights and Privacy Act of 1974, Northeastern University permits its students to inspect their records wherever appropriate and to challenge specific parts of them when they feel it is necessary to do so. Specific details of the law as it applies to Northeastern are printed in the Student Handbook and are distributed annually at registrations of University College and the graduate schools.

Office of Services for the Handicapped

The Office of Services for the Handicapped (OSH) provides a variety of support services and general assistance to all of Northeastern's disabled students and employees. The University's efforts to comply with the Rehabilitation Act of 1973 are coordinated by Ruth Bork, OSH director, 5 Ell Center, 617-437-2675. (TTY number is 617-437-2730).

Disclaimer

Tuition rates, all fees, rules and regulations, courses and course content are subject to revision by the President and the Board of Trustees at any time.

Emergency Closing of the University

Northeastern University has made arrangements to notify students, faculty, and staff by radio when it becomes necessary to cancel classes because of extremely inclement weather. AM radio stations WBZ (1030), WEEI (590), WHDH (850), WRKO (680), and FM stations WBCN (104.1), and WROR (98.5) are authorized to announce the University's decision to close. The TTY telephone number (a teletype machine) for the hearing impaired only is 437-8516. Since instructional television courses originate from live or broadcast facilities at the University, neither the classes nor the courier service operate when the University is closed.

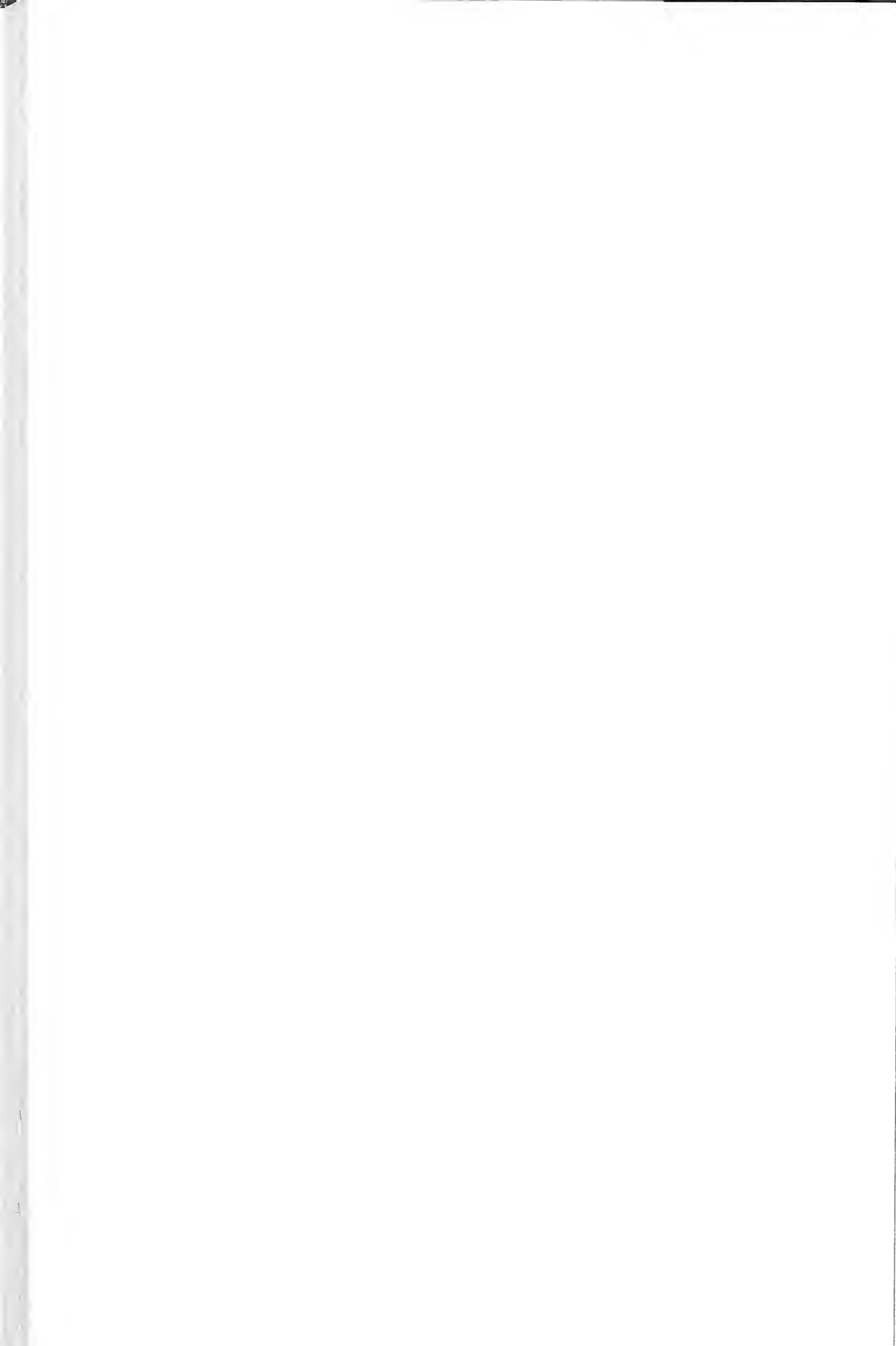
Registration Information

To obtain course listings for the School of Law, please refer to the School of Law catalog.

In order to register for courses outside your graduate school, you *must* meet the requirements of the school offering the course(s) as well as your home school.

Students may not register for any courses outside their school unless the appropriate permit is presented at registration. Consult your graduate school office for details concerning these procedures.







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